HITCHCOCK'S Machin BLUE BOOK

FOUNDED

SEPTEMBER 1939

1905



HARD

THE intricate and delicate parts of the Hamilton Watch require accurate tools—Hardings Preloaded Ball Bearing Bench Lathes assure this essential quality. Precision turning, grinding, diamond boring, lapping and many other operations are performed con-tinuously each day with these modern machines.





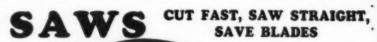
Read what Mr. C. W. Coslaw, Mechanical Superintendent of the Hamilton Watch Company wrote:

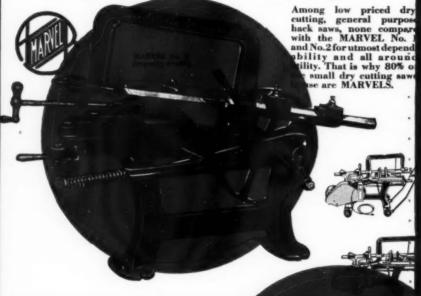
YOU will be interested to know that the highest precision grinding and other work is campleted on the Hardinge Cataract Lathes with preloaded ball bearing spindle construction. This is a point on which we were, frankly, skeptical when your first Lathes were purchased, but experience has proved that our Hardinge Cataract Lathes are thoroughly reliable for this type of work and can be depended upon for accuracies to within 1,0001". The prejudice in the minds of some of our oldest and best dismakers against changing to the modern Cataract Lathes has entirely been overcome, and I feel sure that other two years' experience that our best man would consider it a demotion if they were transferred from the Hardings Cataract Lathe."

Precision Machine Tools Since 1890

PUBLISHED AT 508 SO. DEARBORN ST., CHICAGO

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also available in Motor Driven Types and Portable Models.

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HITCHCOCK'S MACHINE TOOL BLUE BOOK

Page 1



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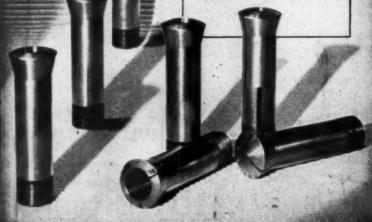
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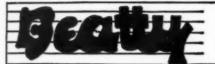
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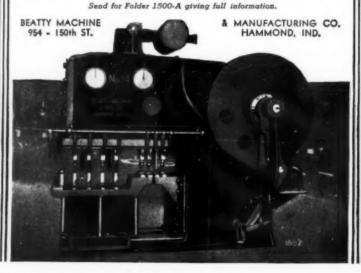
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	No. 13	No. 14	No. 15
Face of slide, r to I, St'd	121/2"	121/2"	13"
" " Maximum	24	24	34
" " front to back	48	60	60
Die space	42	481/2	483/2
Stroke	2	21/2	3
Throat	25	281/2	34
Face of table, front to back	46	60	64
" " r to I, St'd	22	22	28
" " Maximum	30	34	38
Capacity	200T	300T	400T
Shipping weight, Ibs.	42,000	57,000	76.000
Motor required. H.p.	73/4	10	15
Spacing table to suit requirements		-	

Punching capacity 2 holes 136" 4 holes 136" 4 holes 136" thru 1% thru 1% thru 136"





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HITCHCOCK'S MACHINE TOOL BLUE BOOK

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All model Hanna Cylinders may be equipped with adjustable pneumatic cushions at either end or both ends. Their low first cost recommends them for all manner of operations involving short or long movement.

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Apex Safety Friction Chucks are driven by a series of fiber and steel discs with large friction area. Adjustment is made by accessible nut which holds the tension constant. End thrust does not affect setting of friction.

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Apex Vertical Float Tapping Chucks, positive drive, for multiple tapping. Vertical float permits each tap to enter free and taps its hole true to size, and automatically compensates for taps of different lead.

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18' swing 5¾' spindle travel. Sand cast, machined V-belt pulleys.

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Extensible cross-arms for greater leverage have locat ing grooves for extended and central positions.



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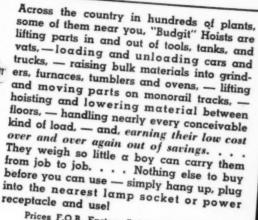
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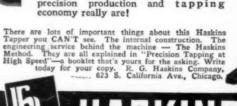
Taking in too much territory? Listen: this great Haskins Tapper is more than backing up any statements we ever made about

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Capacity 2"x2"x¾" angle iron or smaller. A pair of tools that every shop ought to have. They are Nos. 50 and 51 in our catalog.

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No. 20 **Ball Bearing** Punch

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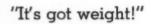
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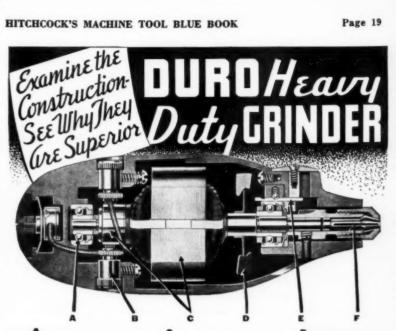
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Square cartridge type brushes for maximum seating capacity and Al performance.

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MOTOR—Full 1/2 HP, ball bearing, air jacket, repulsion induction, 3500 RPM.

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CORE—5/16" diameter by approximately 5'.

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The newer, tougher alloy steels need offer no unusual machining problems, for there are ARMSTRONG TOOL HOLDERS especially designed to handle them. The ARMSTRONG Spring Cutting-off Tools have a "goose-neck" form and resiliency that prevents work from climbing up on the cutter, prevents excess tool breakage, and makes cutting-off an extra-

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It is a sound policy whenever faced with a difficult cutting problem to first look in the ARMSTRONG catalog for there you will find efficient cost-cutting tools for every operation on lathes, planers, slotters, and shapers.

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10% down, balance monthly.

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CLEVELAND

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Prices of Popular Sizes

Size and Type of Lathe	Dist.	Ship-	Price	Price	Price
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	tween	Wgt.	shaft	Motor	Motor
	Centers	Lba.	Drive	Drive	Drive
9"x3" Workshop Lathe 9"x3" Junior Lathe 9"x3" Std. Chg. Gear 9"x4" Quick Chg. Gear 9"x4" O.C.G. 1" Collet	17° 163%° 163%° 273%°	370 416 491 541 885	\$ 95 241 298 372 482	\$167 324 381 455 567	\$176 379 436 510 622
11"x4' Std., Chg., Gear	24"	965	411	494	570
11"x5' Quick Chg., Gear	36"	1035	492	575	651
13"x4' Std., Chg., Gear	10"	1460	478	592	688
13"x6' Quick Chg., Gear	40"	1560	599	713	809
14!/4"x5' Std., Chg., Gear	241/3"	1995	609	739	859
14½"x?" Qk. Chg. Gear	48½°	2145	744	874	994
16"x8' Quick Chg. Gear	58°	2460	868	998	1129

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879 East Madison St. - - -South Bend, Ind., U.S. A.

EDITOR'S PAGE

How much is five-and-one-half acres?

Not so much if you're considering farms. But in terms of floor space—packed with all the latest and finest developments in machine tools and manufacturing equipment—with all of it in actual operation—well, its an educational opportunity you simply can-

not afford to miss.

In this greatest of Tool Shows at Cleveland next month, you'll find the answers to manufacturing problems that have been troubling most plantstools that will enable you to slash production costs-speedy equipment that will help you to step-up volume without plant expansion - precision machines that will increase operating efficiency and improve the prod-- safer and more durable tools that will soon pay for themselves through savings which they will make possible.

The Machine Tool Congress in conjunction with the Show is another wonderful educational opportunity. Nine important trade and industrial organizations will hold meetings, to be addressed by recognized authorities.

Performance of production equipment throughout the country is a matter of paramount importance because of the present economic picture.

These Shows are not an annual occurrence. The last one was held in 1935. It will be several years before you have another opportunity like this — and much can happen in the interim.

SEE YOU AT THE SHOW!

Business Holds Gains . . .

The rebound in business activity from a minor Spring drop restored production to the initial level with which the year started.

Summer usually brings more or less sluggishness, but allowing for normal seasonal variations, general progress has been quite steady. Little variation is indicated until the customary Fall upturn, when further improvement is likely.

Industrial production for the first six months of the present year was some 23 per cent better than the correspond-

ing period of 1938.

Although there has been evident improvement, production just about duplicates that of 15 years ago, in spite of the population increase since then. Business fluctuates about half-way between the depression "low" and normal times. Stagnant capital and unemployment show that many important factors in the problem of recovery wait to be solved.

We're on our way to better times but we need some tuning-up — perhaps fresh oil in the motor, a greasing job and some of the brakes are dragging. It's no job for a wayside

mechanic.

The Safety Record . . .

Accidents are fewer and less severe in the Machinery Field. This gratifying result of the organized effort to reduce casualties in the industry is shown by the National Safety Council's report for 1938.

The index for frequency was 8.29 and for severity, 070 among manufacturers of machinery. Both of these are well below the average for all in-

dustries.

Substantial reductions from 1938 were made in both injury rates. Frequency showed a drop of 31% and severity was reduced 25%. These reductions exceed the showing made by all industries.



Thousands of steel buyers are now enjoying the time and money saving features of the Ryerson Certified Alloy Steel Plan. They get carefully selected alloys which have all hardening factors (analysis, grain size, etc.) within a very narrow range. With every shipment, large or small, Ryerson sends accurate data on heat treatment response, and chemical and physical properties. There is no need to test, or experiment in order to secure desired results. You too can have this valuable data. It is given without additional cost or obligation. Simply specify Ryerson Certified Alloy Steels on your next requisition. Immediate shipment will be made from large and complete stocks of these accurately identified, known quality steels, Ryerson Certified Steels also include carbon, tool and stainless steels. Write for the Ryerson Stock List, which gives data on all Ryerson Certified Steels.



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Purposes of Alloys in Carburizing Steels

by Hudson T. Morton*

MUCH has been written on the use of special alloys or elements in steel, but where can the designer or machinist turn for a short, concise, and accurate evaluation of each of the important elements in low carbon steel? This paper is written to fill this definite need.

Certain elements occur naturally in the iron ore and are not entirely removed during the steel-making operations, such as, manganese, phosphorus, sulphur, and silicon. Others are added to the molten steel to deoxidize or "cleanse" the steel thereby removing impurities or causing certain grain size characteristics. These elements are manganese, silicon, aluminum, zirconium, etc. Finally, alloys, singly or in combination, are added to give the steel special properties of high strength, elasticity, toughness, hardness, or machinability; which alloys are mangan-ese, nickel, chromium, molybdenum, vanadium, celenium, sulphur, or lead. Each element will be discussed by itself explaining its effect on the steel.

In order to understand fully the later discussion, it is necessary to become familiar with a few principles of steel-making practice. Steel is basically iron containing small amounts of other elements dissolved in it and not visible under the microscope, or some of which combine with it to form new compounds which are visible at certain magnifications. Steel is made by melting pig iron, scrap iron, scrap steel and limestone in proper proportions and passing air over it to combine with the carbon and impurities. Other com-

pounds such as iron ore, ferro-manganese, ferro-silicon, limestone, coke, etc. are added at proper intervals during the melting and soaking periods to control the composition of the slag floating over the molten metal, protect it from excessive oxidation, and react to remove some of the impurities. Towards the end of the melting and soaking periods good carburizing steel is deoxidized or "killed" by pouring off the basic slag either from the furnace or ladle and then adding compounds of silicon, aluminum, zirconium, fluorspur or other elements, and coke which change the slag from an oxidizing one to a deoxidizing one. This action also tends to remove the gases from the steel. For more alloy steels this deoxidation is done in the furnace before the steel is poured to prevent oxidation and loss of the alloy, but with some plain carbon steels and a few alloy steels that is done in the ladle before the molten metal is cast in the ingots. As a result of the removal of many impurities and gazes, the cast ingot is relatively solid and homogeneous with only a small pipe of entrapped gas and shrink, at the top near the center of the ingot of cast steel. Most of the elements added during the deoxidation operation react and float away in the slag, leaving only a small percentage in the finished steel. Aluminum or silicon, etc. are added to the ladle in small amounts, which react in such a manner that by proper timing of the pouring operations with the steel composition, the

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inherent grain size of the finished steel is properly controlled, either to give a fine grained steel or a coarse grained steel as the melter desires. Whether these elements form tiny oxides or divide into tiny particles evenly dispersed throughout the mass is a controversial question at the present time but the effect is very definite.

Carbon is the most essential element in steel besides the iron. It combines with the iron to form iron carbide containing three parts of iron with one part of carbon, having the chemical formula Fe3C (of 6.67% carbon). By using the usual carbon range of .10 to 25%, the steel is soft and pliable thereby allowing it to be bent, formed or machined to the shape of the required part. Subsequent carburizing. either by soaking for a long period of time at 1600-1750° F in a gas medium or in containers with a carbon, charcoal, or coke base compound, the composition of the surface layer of the steel is changed. This layer may vary from a few thousandths of an inch to an eighth of an inch in depth depending upon the temperature, length of time, and carburizing material used. By quenching this heated steel part in brine, water, oil, etc. from the carburizing temperature or after reheating to 1400-1550° F, the form of the iron carbide in the surface laver (case) is changed. The steel surface may thus be hardened to Rockwell C 60-68 provided the depth of case exceeds .025" and carbon content is .80% or more. Shallower cases or improper heat treatment will give correspondingly lower Rockwell hardness readings.

The iron in steel is called ferrite and is soft and pliable. The iron carbides are hard and less ductile thereby increasing the physical properties of steel as compared to pure iron. For deep drawing purposes, steels with 14% carbon and less are preferred. For carbon and less are preferred. For carburized parts with high core strength, steels with 20 to .25° carbon are often used and some gears containing as high as .40% carbon to assure the proper core strength, are given a thin carburizing

treatment for high surface hardness and resistance to wear and abrasion. Most axle shafts and moderately stressed parts contain about .40% carbon with or without alloys and heat treatment. Highly stressed parts and tool steels contain about 1.00% carbon or even higher amouts.

In carburizing steels, the alloying elements can be divided into three groups according to whether they dissolve in the ferrite (iron), combine with the iron carbides, or form oxides which are impurities. The following listing was suggested by A. B. Kinzel:

Classification of Principle Alloying Elements in Steel

Soluble in	Carbide	Oxide or Ni-					
Ferrite	Formers	tride Formers					
Manganese Nickel Copper	Chromium Vanadium Molybdenum Tungsten Cobalt Titanium	Silicon Aluminum Zireonium Calcium					

Small percentages of these carbide compounds and oxides are soluble in the ferrite. Larger amounts are insoluble and are readily visible at proper magnification under the microscope. Besides the above elements phosphorus, sulphur, oxygen, and nitrogen are present in steel as impurities. These are present as phosphides, sulphides, oxides, and nitrides of iron and other elements which are visible at proper magnification.

Manganese

The third important element in car-

burizing steel is manganese. It is found in the iron ore, pig-iron, and scrap used in making steel. It reacts with sulphur to form manganese-sulphide and with oxygen to form manganese-oxides which partially dissolve in the slag and are removed, while some remain in the steel in particles large enough to be seen under the microscope. Ferro-manganese, containing about 80% manganese with 65%

carbon is the form in which manganese is added to the steel during the melting operations and later to remove impurities of sulphur and oxygen or control composition.

Manganese dissolves in the ferrite and thereby lowers the critical temperature for heat treating, causes deeper penetration of hardness, increases the hardness and tensile strength of the steel, and when added in the proper amount allows the steel to be hardned in oil instead of water or brine. Its percentage varies from .30-.60% in water hardened steels; .70-1.00% in high manganese carbon steels; to 1.00-1.60% in the free machining steels containing sulphur.

Phosphorus

Phosphorus is an impurity in the iron ore and pig iron from which the steel is made and is partially removed by reactions with elements in the slag but not completely removed because of the added time and ccst required for so doing. It is found in the form of phosphides of iron and other ele-

ments which may cause directional properties in the steel, having various names such as ghost lines.

In percentages of .045% and less, it has little effect on the steel unless it should segregate into local areas. Phosphorus is intentionally left in Bessemer steel (1112 and X1112) as an aid in machining.

Sulphur

Sulphur is also an impurity in the raw materials and is removed by reactions with the slag and manganese. In the finished steel, it appears under the microscope as long dove-gray inclusions of manganese sulphide. In percentages of less than .045% it has little effect on the steel. In making freemachining steels, sulphur is generally intentionally added to obtain amounts from .075 to .15%. Here the manganese sulphide inclusions break the continuity of the steel chips as they are cut from the steel and thereby allow the use of higher machining speeds and heavier feeds.

Silicon

Silicon occurs in the iron ore and is

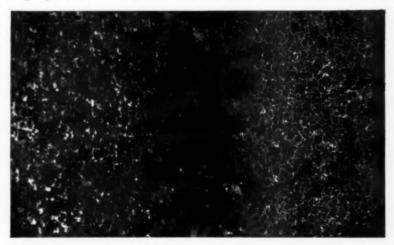


Illustration of medium fine grain (size 6) steel carburized 8 hours at 1700 $^\circ$ F., and slow cooled. Details are as shown. Magnification 100 times.

Strangth The Flongs Rod.

23

40 46 50 50

SAE LIST OF CARBURIZING STEELS

FtLbs.	47							40	20	40		47		34	38	20	21		
1	.0		0.					20	64	10		.0		.0	.0.	. 3	.0		
tion	8		21%					189	14%	199		26 %		179	150	19%	175		
um per sq. in. tion FtLbs.	80.000		20,000					000'20	138,000	000'06		165,000		10,000	150,000	85,000	95,000		
Silicon Nickel Chromium Molybdenum Copper Vanadium p			42					1(1			10		7	7		.15%	min18%	desired
Copper																			
denum																.30%	.30%		
Avloh																.20-	.20-		
hromium A												.4575%	.90-1.25%	1.25-1.75%	.6095%			%06° -09°	.80-1.10%
Nickel C								4060%	.25-1.75%	.25-3.75%	75-5.25%	00-1.50%	.50-2.00 %	25-3.75%	75-3.25%	.65-2.00%	25-3.75%		
licon	:	* *							** 1.		** 4.	**	1	e	** 2	** 1.	**	* *	
	CIX.	dx.			.0			max.	max.	max.	CX.	max.	CIX.	dx.	dx.	max.	CIX.	JUK.	JUX.
Sulphur	.055% ш	.0556, п	.1020%	.2030%	.075159	.075159	.075159	n %050.	п %050.	.050% п	п %050°,	п %050.	1050ch II	п %050.	n %080.	.050% n	,050% m	.050% n	n 2/050.
rus					max.	max.	max.	max.											max.
Phosphorus	.045% п	.045% n	.0913%	.0913%	.045% n	.045% n	.045% n	.040% п	.040% n	.040% m	.040% m	.040% n	.040% n	.040c/2 n	.040% n	.040% n	.040% n	.040% 1	
ese		% 00.		% 06.	% 00	% 08	% 08	200	% 08	% 09.	% 08	% 0%	2000	95 08	% 08	25.0%	25 05	% CS	90 09
angar	.306	.70-1.0	.60-	.60-	.70-1.00%	.00-1.30 %	.30-1.60%	.306	.306	.306	.306	.30.	.306	.300	.300	.40-	.40	.30-	.30-
Number Carbon Manganese	10.20%	.1020%	0816 %	2,91.80	.0816%	10.20% 1				.1020%					.17 % max.			.15-,25 %	
Number (1015	X-1015		X-1112 (X-1314	X-1315 .			2315									6115

"The 20 group of carburizing steels with .15-.25% carbon content are also available for use with the same other elements as listed **Silicon contents of SAE basic open hearth alloy steels shall be 0.15-0.30%. For electric and acid open hearth alloy steels, the silicon content shall be 0.15 minimum.

		21%			20 %	21%	25 %	13%
		81,000			85,000	107,000	95,000	160,000
SAE								
BY				3080 %				
OTHER AVAILABLE CARBURIZING STEELS NOT LISTED BY				.30-				
IST		0/			0/	1/20	200	200
1		.25			020	5-,25	030	,20-,30 %
ž		-15			1	.1.	CA	2
SIE		PAN	50%	800%	750%	.800%	1009	700%
STE		.1525% COMPANIES	50.1	.50	.45-	.50	.30-	.50-
SN				%00	00%		200	50%
IZI		0	0//	8, -00	30-1.5		55.2.0	75-2.2
BUE		30%	1.00		1.0		1.1	1.
AR		.20	.50	4		*		
EC		VA	nax.	max.	max	шах	max	max
ABI		40%	1 %0	2000	2005	12005	500%	1200%
AIL		0,	.05	0.	0	c0	0.	c0
AV		max	0%	max	max	mas	max	may
IER		40%	020	100%	40%	140%	400%	1400%
OT		0,		0.	0, 9	3. 3	0. 9)° 0
		.90 %	,50%	% 00.	609.	.80	20%	.70%
		.70	.10-	.70.1	.30.	.50.	.40	.40-
		MS 290 .2025% .7090% .040% max040% max2030% VARIOUS STEEL COMPANI	max	2 %	2 %	35 %	5 %	25 %
	Ser.	.202	,10%	.15-2	.15.2	.15.	.152	.15.
	Chrysler	290	ten	070	20Mo	120	320Cr	320
	Chr	MS	Cor	30	31	4	46	4

***This data is taken from Carnegie-Illinois Steel Company book "USS Carilloy Steels" and data worked out by the author in the labora-

•••Cooled 1675• F, Quenched 1525° F, Drawn 300° F.

in pig iron as well as most scrap. The silicon dissolves in the slag, removing oxides to form silicates thereby purifying the steel. Ferro-silicon is the most common material used for deoxidizing steel because it reacts rapidly in the removal of oxides, but .15 to .25% of silicon is retained in the finished steel. Silicon is sometimes used when properly coordinated with quantities, composition, ladle size, pouring speed, and cooling rates to control the inherent grain size of the finished steel, but is more difficult to control than aluminum in getting a fine grained steel, and will usually result in a coarse grained Sicilon-killed steels are relatively uniform in composition from surface to center and top to bottom of the ingots, but contain minute inclusions of hard metallic silicates. The presence of silicon slightly increases the hardness and tensile strength of the steel.

Nickel

Nickel is added to the molten steel after deoxidation, but may be present in noticeable amounts in the scrap used in making the steel as very little is lost during the melting operations. It dissolves in the ferrite and is not visible under the microscope but its effect is very noticeable. It is generally accompanied by fine grain size, increased ductility, slight increase in hardness and strength, a lowering of the critical temperatures, better hardenability, and ability to harden in oil instead of water. Its common percentages are 3.25-3.75% alone; 1.00-1.50% with chromium; 1.50-2.00% with higher chromium, molybdenum, or chromium and molybdenum. Further details of various compositions are shown in table II. Nickel is one of the most useful alloys used in steel today as it can be employed singly or in combination with other alloys. It gives toughness while the other alloys give the additional properties needed.

Chromium

Chromium is always added to steel after it has been properly deoxidized, either in the furnace or in the ladle, because it readily reacts with oxygen and would otherwise be lost in the slag. For this reason, each steel mill works out its own formula as to the amount of excess 'chromium to add in order to get the required finished composition.



Illustration of medium size grain (size 2) steel carburized 8 hours at 1700° F., and slow cooled. Dark area at extreme left is beyond edge of specimen. Dark area in center euctetoid of approximately, 90% carbon steel. White lines at left are carbides of 6.87% carbon and iron. White lines at right are ferrite or nearly pure iron. Sample etched 20 seconds in 2% nitric acid in alcohol. Magnification 100 times.

Chromium reacts with the iron-carbide, increasing the steel hardness, strength, hardenability, penetration of hardness and abrasive resistance; slightly raises the critical hardening range, and allows the steel to be quenched either in oil or water, besides air-hardening characteristics with higher carbon contents. The carbides found in chromium steels are difficult to dissolve during ordinary heat treating operations and remain as harder carbide particles in the casehardened surface of the parts, thereby greatly increasing the resistance of these parts to abrasive wear. For this reason chromium steel is used widely in bearings (as 52100 and 5120 steel) and other parts subject to wear. Chromium is often used in combination with nickel, vanadium, nickel and molybdenum to increase the wear resistance and crushing strength. For details of composition see table II.

Molybdenum

Molybdenum gets plenty of publicity in the United States due to its abundance. It is added before or after deoxidation and reacts in steel in the same manner as chromium, except that approximately one-third as much is needed to accomplish the same results. It is used by itself in the "AMOLA" series of patented steels which are notable for their fine grain size, "abnormal" microstructure, and high impact strength. The combination of molybdenum with nickel in SAE 4615 steel is one of the most popular alloy steels on the market today because it combines strength, wear resistance, ease of heat treating with great toughness and shock resistance. In combination with chromium and nickel it forms an important series of high core strength steels having great value in the oil industry as outlined by Harry W. Mc-Quaid in the May, 1939, issue of Metal Progress: "High alloy steels of carburizing grade are very sensitive to carbon variation, so that the cheaper types in higher carbon may frequently show better core properties than the more expensive ones with low carbon content."

"In the Class under discussion (Oil Production Tools of high core strength) the SAE Nickel-molybdenum 4820 is at present the most widely used steel with a slight trend to the type having approximately 2% nickel, 0.60% chromium and 0.25% molybdenum (SAE 4300). It is quite possible that the future may develop combinations of silicon, molybdenum, and chromium

not used in this class.

"It will be noticed that the steels in this group all contain nickel. Nickel strengthens the steel, not by forming hard carbides but by forming a nickeliron alloy stronger than the iron without it. It is an extremely important addition where increase in strength and toughness are primary requisites. In order to improve the resistance of nickel steel to abrasion, a carbide forming element, such as chromium or molybdenum, is usually added. When operations develop relatively high surface temperatures the addition of molybdenum seems to reduce the tendency to soften."

Vanadium

Vanadium reacts in the molten steel to cleanse it and remove oxides or other impurities which float away in the slag. Very small amounts, seldom over 20% remain in the finished carburizing steel. This element forms carbides which are partially soluble in the ferrite, causing the steel to be fine grained, and increasing toughness and ductility. More often the combination of .80-1. 10% chromium with .18% vanadium is found than the plain vanadium steel for carburizing purposes.

Aluminum

Alumium is used as a deoxidizing material instead of and with silicon. Its most useful purpose is its addition to the steel when in the ladle so as to control grain size. Fine grained steels, either normal or abnormal can be readily obtained by proper coordination of amount of aluminum added, steel composition, size of ladle, pouring time, and cooling rate in the molds. Up to the pressent time the aluminum has not been seen in the steel but it is thought that it disperses into very fine particles of aluminum or aluminum oxide which act as nuclei in the formation of grains. Its percentage in the finished steel seldom exceeds .01% and generally .005%







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(except in special nitriding steels).

Zirconium

Zirconium is sometimes used as a deoxidizing material in place of silicon or aluminum, or in combination with them. It also reacts as they do to control the grain size of the finished steel. The quantity remaining in the finished steel is negligible but its nitride is visible under the microscope as small squares or cubes.

Titanium

Titanium is another element used in deoxidizing steel and controlling its grain size. The percentage retained in the finished steel is also negligible, although its effect is very noticeable.

Lead

Lead is one of the newer additions to steel, which is being added in the ladle to improve the machining properties of the steel. Thus far its exact particle size and form has not been seen under the microscope but free machining steels, plain carbon steels, and some alloy steels have shown as much as 6% to 30% increase in machining speeds and feeds when lead was present in the steels in amounts of 25% and less. No appreciable changes have been found in the physical properties due to this addition of lead.

Copper

Copper is not being used extensively in carburizing steels but is listed in Corten steel where it acts to decrease corrosion in low-carbon steel. It dissolves in the ferrite and has begun to play an important part in steels having resistance to corrosion. Its mechanical effects are negligible.

Advantages of Alloy Steels

Regardless of which alloy steels are used, there is an advantage to be gained by specifying an alloy steel. Alloy steel practice differs from plain carbon steel practice because generally cleaner scrap is used with less rust and scale on it, requiring less deoxidation at the end of the heat. Smaller furnaces are used which are easier to control in composition, operation, and temperature, and the mills are willing to spend more time in watching and making each melt of steel properly, due to its higher selling price and smaller sales volume for each analysis. Also as a prerequisite to the addition of the alloy. great care must be taken to get the steel in proper condition, thereby giving it very desirable physical properties along with the alloy effect.

Table II gives the details of the usual compositions found in alloy and plain carbon carburizing steels. In most cases, only the .15% carbon steel is listed but either the .15% or .20% analysis can be obtained from the mills. It is important to note the great number of combinations of two or three alloys which are coming more into prominence where steels of high core strength, shock resistance, and abrasion resistance are required in the same gear,

TABLE III PROPERTIES OF ALLOYS IN CARBURIZING STEELS

Carbon	Tensile	Hardness	Impact	Ductility	Grain Size	Reacts	Purpose in Steels
Element	Strength		Strength			with	
	increases	increases	increases	decreases	no effect	carbides	hardens it
Manganese							
.3060 %	increases	Increases	Increases	decreases	enlarges	ferrite	cleanser
1.00-1.60 9	increases	increases	increases	decreases	enlarges	sulphur	harden in oil
Phosphorus							
und045 %	negligible et	ffect in this	percentage			iron	impurity
Sulphur						9	
und055 %	negligible et	ffect in this	percentage			manganese	impurity
.07515%	negligible	negligible	sl. decrease	sl. decrease	negligible	manganese	improves machining
Silicon	increases	increases	decreases	decreases	enlarges	oxides	cleanser
Nickel	sl. increases	sl. increases	increases	increases	decreases	ferrite	toughens
Chromium	increases	Increases	increases	decreases	enlarges	carbides	hardens-decreases
					C. C	CMITTALE	wear
Vanadium	al increases	al, increases	increases	increases	decreases	oxides &	cleanser & toughens
					acc reasons	carbides	causer & toughens
Molybdenun	Increases	Increases	increases	al, increase	al, effect	carbides	hardens
Aluminum	_	***************************************	increases	Increases	decreases	oxides	control grain size
Zirconium	_	-	-		decreases	oxides	cleanser
Titanium	_	_		-	decreases	oxides	cleanser
Copper	_	**	-	_	CHECKER CO.	ferrite	corrector resistance

bearing or other part.

Table III has been prepared as a ready reference for the busy engineer or executive to determine which alloy he needs, according to which physical properties are most important in the design of the particular part under consideration, whether it be:-gears, needle bearings, quill bearings, ball bearing races, roller bearings, cams, pinion shafts, piston pins, pump shafts, spindles, tool holders, oil industry tools, or other parts.



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- 3. Freedom from multiple adjustments - no wearing of friction parts.
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RACINE Heavy Duty Hydraulic Series. Fastest cutting for heavy bars, billets, die blocks. Single lever all front control. Capacities 10"x10" up to 14"x20". May be equipped with the RACINE Hydraulic Automatic Stock Feed.

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OCT. 4 to 13, 1939



PUNCHING Small Holes

A new piercing technique for small hole production.

By J. A. Smith

UNTIL recently it has been sort of an unwritten rule throughout industry that holes smaller in diameter than the thickness of the stock should be drilled. That was because there was no feasible method of punching these small holes in regular production.

Now this rule, like many others, can be tossed into the discard, for it is possible to punch holes in commercial production with diameters ½ or 1/3 of the thickness of the stock to be perforated—for example, ½" holes punched through

14" thick steel.

This piercing performance is made possible and commercially practicable by the use of a new piercing punch, supported by a patented intermeshing sleeve which is now being used by many of the largest metal fabricating and stamping concerns in the country. It is pretty generally understood that a needle can be driven through a coin if the needle is suit-

ably supported within a cork. Employing this same principle, the Durable patented piercing punch with the intermeshing sleeve supports the piercing punch and makes it possible to pierce small holes in regular production that have hitherto been classed as "impos-

sible".

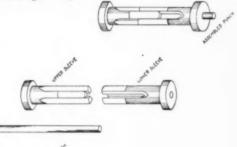
It can be used on malleable castings and forgings as well as on sheet metal. The makers, Durable Punch & Die Co., 711 West Lake St., Chicago, claim that it will reduce punch breakage on any class of piercing. Further that it will cut a cleaner hole and cut it with less

draft than other constructions. It can be incorporated in standard die constructions and fits standard presses and operates at regular press speeds.

operates at regular press speeds.

The Durable punch comprises three pieces—a punch and two sleeves.

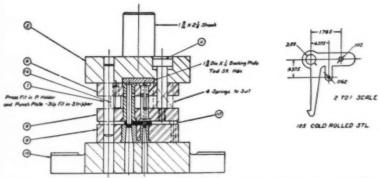
The punch is a plain rod of uniform diameter except for a slightly larger head at one end for stripping. The two sleeves intermesh and support the straight punch throughout its entire length, preventing any chance of buckling.



On each sleeve, three segments of 60-degrees are removed, leaving three prongs each of 60-degrees. Therefore, at any part of the sleeve, the punch is supported by three equally spaced 60-degree segments.

In operation, however, the sleeves intermesh and in the center of the punch where the tendency to buckle under pressure is greatest, the punch is supported 180-degrees with each sleeve—actually completely surrounded with six 60-degree prongs.

The punches are made of Carbon, High Speed or High Chrome High Car-



bon Steel, as required.

In application, one part is pressed into a stripper pad sufficiently heavy to hold the sleeve rigidly. The other portion is inserted in the punch pad which should be thick enough to hold this part of the sleeve in proper alignment. The sleeve in the punch pad requires a snug fit but does not have to be a press fit. Both stripper plate and punch pad are counterbored for the head of the sleeves. At no time is there any action which would tend to force the sleeve out of the stripper, so only a light press fit is sufficient.

The accompanying illustration shows a die built by one of the largest manufacturers of vending machines, for a limited production job. Only 7000 of these pieces were required so it was first decided to build a plain blanking die and drill and ream the holes in a drill jig. Checking the cost of the drill jig plus the extra labor in drilling, it was evident that a piercing die of the type shown would more than pay for itself. The .250" and .108" holes were pierced and held straight and to size within .0005" without reaming. 1/16" hole was merely a spring hook hole and unimportant but it came out straight and to size.

The die was constructed with a plain punch holder and die shoe purchased from stock.

The guide pins (7) were also used as set pins and were put through the punch pad, stripper pad, and die block for alignment. The holes were then laid out on the face of the die block and drilled through, after which the three blocks were reassembled and the hole drilled through stripper and punch pad. The three holes were then reamed to the size of the sleeves required and counterbored for the sleeve heads. Note that the die buttons are shouldered on the bottom, eliminating the necessity of a press fit in these buttons and giving a better bearing on the cast iron base.

Die buttons were made of non-deforming oil hardening tool steel and turned to size without any grinding, which proved satisfactory.

Sleeves were a press fit in stripper plate (8) and a slip fit in punch pad (6). The four equalizer buttons prevent the stripper from tipping and the stop button (16) is a safety button to prevent press operator from lowering the press so as to damage the sleeves.

The entire die was laid out and completed in 21 hours, with a material cost of only \$12 more than the estimated cost of the drill jig. The piercing of the 7000 pieces showed a saving of \$56 as compared to the estimated drilling and reaming cost. This particular die is not recommended for large production but is well worth consideration on short runs.

The other die shown was used by one of the large automobile manufacturers in the Detroit area. It has been in use for some time and has been completely

A Complete Line Line Lourcost Hydraulic Bench Assembly and Broaching 7 Torrobe 18 Stroke 18 Stroke Smooth weby

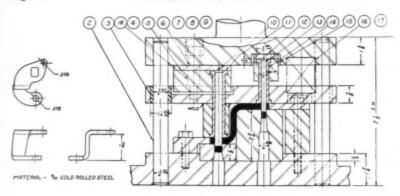
405

send today for Bulletin VJ1-39 giving details on these time- and moneysavers.

COMPANY

147 Jos. Campau Detroit, Mich.





satisfactory.

This is a construction in which the part is pierced after forming. On such formed pieces, the relation of the holes to one another is sometimes very important. The pieces are always uniform as to center to center measurements when a piece is pierced with a die of this type.

This construction has made possible two distinct features which have heretofore been considered impracticable piercing of the small hole instead of drilling, and piercing of both holes to size and straight, eliminating reaming with the natural reduction in cost.

The sub-guide pins (2) are a press fit in the die shoe and the stripper has inserted hardened bushings. On any die in which the sub-guide pins are fastened into the die shoe, the stripper should be bushed because with this construction, the stripper travels on the sub-guide pins the length of the stroke of the press. When the sub-guide pins are fastened into the punch holder the stripper travels only the thickness of the stock to be punched and is not subject to so much wear. Therefore, bushing of the stripper is not so important.

A die to pierce formed pieces should have sturdy sub-guide pins, as a formed blank will show variations not found on flat blanks. Unless the stripper is held firmly, shortened punch and die life will cause additional maintenance costs. This increased maintenance cost can be avoided by the use of sturdy sub-guide pins.

The use of the dies designed to pierce after forming the part, is increasing. When parts are pierced before forming, trouble is often caused by variations in stock thickness and temper which have a bearing on material stretch, with subsequent variation of the holes.

These are just two of the many recent applications of Durable punches by leading industrial concerns. A handbook showing many of these other die designs with full explanations of the construction features may be had by writing the Company. If you write on your Company letterhead there is no charge for the book.

Ryerson General Data Book

A valuable reference and data book is offered by Joseph T. Ryerson & Son Inc., Chicago. It contains metallurgical definitions, heat, hardness, and numerical equivalent tables; weight, dimension, and specific gravity tables; carbon steel, drillrod, non-ferrous, tubing, sheet, and manufacturing tolerances. Also standard specifications for reinforcing bars, boiler tubes, plates, bridges, buildings; safe load tables, etc. Copies will be mailed on request.

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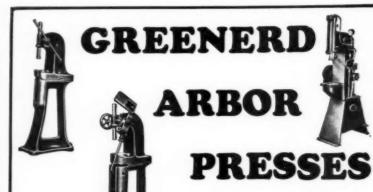
HI-BOY GRINDER

Other models ¾ H. P., 1 H. P., 2 H. P. and 3 H. P. with dustproof or ventilated motors, geared heads, countershafts and many styles of mountings. A size and style for every grinding, sanding, polishing or buffing job! Write for complete catalog and let us help you select the type of unit for your work. No cost or obligation!

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MALL TOOL COMPANY

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standard styles and sizes—manually operated presses from 1/4 to 35 tons pressure - motor driven hydraulic presses from 11/2 to 15 tons pressure.







There's a Greenerd press for every need-assembling, broaching, piercing, keyway cutting, straightening, pressing, molding and similar production operations. Write for catalog No. F.

Originator of the Arbor Press in 1883.

REENERD ARBOR PRESS

Monarch Continues Expansion

CLIMAXING the fifth expansion in as many years, Monarch Machine Tool Co., of Sidney, Ohio recently opened a new factory extension and a new office building. Employment has increased with each expansion and now the Monarch Company employs twice as many men as in 1929.

The new building increases the plant area 35%, making a total of 135,000 square feet. The North wing, devoted to factory area, doubles the final assembly department. The rest of the two-story building is devoted to new offices for all management personnel, an auditorium seating 500, a cafeteria with an all-electric kitchen, an employee's lounge room, new quarters for the design and engineering departments, apprentice training rooms,

photo laboratory, a blueprint room and a large display and demonstration room. The entire building is air conditioned, except the assembly department, which is separated by walls of glass block.

The design and engineering departments occupy four times the space used in the old building. Ceilings are acoustically treated and 1400 watt fixtures provide 60 lumens of light at working level.

The entrance lobby is of Tennessee floral marble. Opposite the main door above a drinking fountain illuminated by indirect light is the inscription:—
"Machine tools are the foundation of modern civilization. They serve to enrich human life."

Keynoting the open house celebrating formal opening of the new additions was the inscription:—Without machine



tools we would have the civilization of the Eskimo or the Chinese coolie, because hand labor produces so little. Deprived of machine tools, men are cheap and goods expensive."

In connection with Monarch's remarkable expansion, Wendell E. Whipp, President of the Company and President of the National Machine Tool Builders' Ass'n stated: — "We simply have not accepted the fact that there was supposed to be an insurmountable depression in the durable goods field. We knew the country's enormous need for improved and more productive machine tools and set out to do what we could to supply that need, embarking on a program of research and development during the darkest days of the depression." The results of this progressive policy speak for themselves.

One of the glimpses into the factory presented on these pages, shows Monarch lathes making Monarch lathes. Another view shows an aisle through the assembly department.

An example of the new modern-styled Monarch precision lathes is also shown, featuring completely built-in motors and controls. This unit is intended to fill the gap between the precision bench lathe and the smallest type geared head tool room lathe.

Master control switch for the 2 h.p. motor is in the hub of the spindle con-



trol switch for forward and reverse operation, located on the headstock.

Forward and reverse starting equipment, together with overload and low voltage relay are in the control compartment under the headstock. Reset button protrudes through the guard. Alongside is a drum type selector switch for controlling the ¼ h. p. coolant pump



DOALL SMASHES RECORD Making Short Run "Forgings"

At Windcharger Corp., Sioux City, Ia., small runs of forgings are made by contour sawing the shapes from solid blocks of steel. They write, "This small brake lever would have meant a monotonous day on the shaper for somebody, but sawing it out on your DoAll took exactly 1½ hours." Quick, accurate, clean "forgings" without any die cost is another DoAll achievement. No material is wasted.





UNMATCHED PERFORMANCE

Contour Sawing, the new DoAll process of machining, is recognized as the fastest precision method of removing metal; cuts out internal and external shapes from any metal up to 10° thick.

Does work of 3 machines. DoAll is a moderately priced, rugged, precision machine tool that replaces shaping, milling and lathe work on a large variety of jobs with enormous savings.

Used in large and small plants in 30 countries, by such firms as Underwood Elliott Fisher, Atwood Vacuum Machine, Taft Pierce, New Monarch Machine, Lectrolite, Federal Cartridge, Waterman Waterbury, Lincoln Engineering, General Instrument, etc.

DO-ALL

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BAND SAWING
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Let a factory trained man bring a DoAll to your plant and show you what it does, what it saves on your own work.

H-9

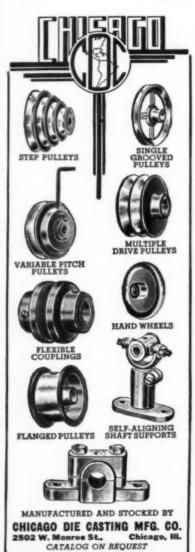
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motor. All wiring except the lead-in is enclosed, and this may be brought up inside the cabinet leg from a floor conduit.

Instead of the conventional louvres, the built-in motors are ventilated by cored slots. These are covered by sets of three chromium plated steel strips, enhancing the clean, trim styling of the machine.

Carboloy Announces New Titanium Carbide Grade

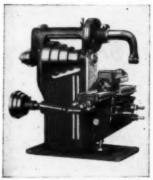
Carboloy Co., Inc., Detroit, Mich., manufacturers of cemented carbide tools and dies, announce development of Grade 78,-a special carbide containing a combination of tungsten, tantalum and titanium carbides. Grade 78 is said to represent a marked improvement over titanium carbide grades introduced by Carbolov Company during the past few years. It is used for taking cuts as heavy as 3/8" with feeds up to 3/64" per revolution in the machining of steel bars and castings. A typical example of the results being obtained with Grade 78 is shown by its use for finish turning eleven steps on an SAE 1045 steel shaft 35 3/16" long, steps varying from 11/4" diameter to 2.78 diameter. This operation previously performed with high speed steel tools with floor to floor time of 33 minutes per shaft. A grade 78 style 4 Carbolov tool now completes the operation in 18 minutes,-a 45% reduction in machining time. This does not include the saving in downtime and grinding time due to longer tool life. Speed used is 180 r.p.m., with feed of .020" per revolution.
J. R. Longwell, Chief Engineer of

J. R. Longwell, Chief Engineer of Carboloy Co., in explaining the use of titanium carbide for metal cutting tools, states that it is used principally in conjunction with tungsten carbide.

"Tungsten carbide," Mr. Longwell points out, "is today the basic metal used in all cemented carbides. Titanium carbide, or tantalum carbide,—in relatively small amounts—are added to the basic tungsten carbide metal for machining applications—such as steel cutting — where the lubricating and other properties of tantalum and titanium appear to be desirable."

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BALANCING TOOL



BENCH CENTER

Four types of Sundstrand Open Line Tools, illustrated, offer dealers attractive opportunities for increased sales; give excellent value to purchaser. Every detail of these fine tools reflects Sundstrand high quality...construction that maintains accuracy, features that promote efficient operation, durability that insures economy.

Sundstrand No. 3 Hand Millers provide rapid, low-cost milling for manufacturing, tool room, and experimental work. Easy to set-up, simple to operate, accurate, rigid, dependable. Also in column type.

Sundstrand Index Bases are made in six sizes, for all makes of machines, are low, compact, have single operating lever, rigid clamping, manual or automatic indexing.

Sundstrand Balancing Tools save time and money in balancing gean, shafts, flywheels and similar work, also on straightening and truing operations. Simple to use, sensitive, accurate. Made in nine sizes up to 24,000 pounds capacity.

Sundstrand Bench Centers are rigid, compact, portable, available in capacities up to 12" swing and 60" between centers.

• Investigate - Write, today, for literature and full information.

Sundstrand Machine Tool Co. 2535 Eleventh St., Rockford, Ill., U. S. A.



INDEX BASE



RIGIDMILS - STUB LATHES

Tool Grinders Drilling and Centering Machines, Hydraulic Operating Equipment - Special Machinesy





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STERLING Speed-Bloc SANDER

Today, more than ever, production men have to put greater stress on cutting of costs. The Sterling Speed-Bloc Sander meets this situation.

This fast, efficient tool is daily saving 25% to 75% in labor and abrasive costs in leading plants over the country. It will save plenty for you.

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A demonstration costs you nothing. Being without a Sterling DOES cost you something. Ask for demonstration NOW.

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The SHOW of Shows

THE World's Greatest Machine Shop in Action will be unveiled at the National Machine Tool Show in Cleveland, on October 4th. The setting will be brilliant. For 10 days thereafter, all that is newest, finest and best in the way of production equipment will strut its stuff for the instruction and edification of the thousands of engineers, mechanical executives and industrialists who will gather from all parts of the world to inspect the tangible evidences of America's mechanical genius.

Builders of the master tools of industry have created new tools to meet new demands. They have also built into existing tools, many revolutionary improvements — many innovations and advanced features which will increase production, reduce manufacturing costs, improve the products, assure safety, convenience of operation and

durability.

New engineering developments, new construction methods, new materials, new standards and methods of finish, new applications of hydraulic, pneumatic and electrical power — all of these will be on parade for the benefit of American industry.

Compared with the most recent show of its kind, held in 1935, this exhibit will utilize 153,000 sq. ft., as contrasted

with 123,000.

The 209 exhibitors will send over 4000 tons of machine tools, requiring a total power load of 900 h.p., to show the machines in operation.

Special lighting has been arranged for the exhibit halls—far superior to the best available in 1935.

"We expect visitors at this Show," says Wendell E. Whipp, President of the National Machine Tool Builders' Ass'n., "to be amazed at the developments which they will find have been taking place in the machine tool industry in the last few years.

"In the depths of the 1939-33 depression, machine tool research depart-

ments and engineers took advantage of the slack times to search for new methods and new improvements which they knew would be required to meet the increasingly exacting demands of America's manufacturing enterprises

when recovery arrived.

"At the 1935 Show, some of the fruits of this research had taken form -but a large share of the new concepts and ideas originated during the depression days still required further testing and development before they could be placed on the market. During the last four years this testing and development has taken place. The machines which will be shown this year represent the culmination of a 10-year period of intensive research and engineering study, designed to make available to American industries, methods of cost reduction and increased productivity, which I am convinced, substantially surpass in performance, machine tool equipment which has thus far been available."

The Armory Show

Sharing the interest and attention will be the simultaneous showing of modern machine and tool equipment in the Central Armory, just across the street from the Auditorium. Here many additional offerings in the way of production equipment will be attractively displayed. As the hours coincide and the exhibits are so conveniently located, it will be easy for visitors to take in both Shows.

The Armory provides 13,000 sq. ft., of floor space. Many American and foreign tool builders will show their latest products. Every indication points to a decidedly worth while exhibition, with numerous innovations in tools and manufacturing equipment.

Show Prevue

A complete prevue of the Shows with details of the exhibits and exhibitors, programs of the meetings, etc., will be found in the October Show Issue of The BLUE BOOK. Watch for it!



Here's a BETTER WAY

... The Cincinnati General Purpose Grinders. They set a new high standard for economical production... Motors are fully enclosed, dirt and dustproof. Wheel guards fully enclosed and adjustable. Push button starter with overload protection. Extra heavy pedestal. Large tool tray and water pot.

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The Cincinnati Electrical Tool Co.

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in the transtay

Van Norman Hand-Mill

Many small jobs found in all production departments can be milled more quickly and profitably on this heavy new machine. Absolute rigidity for maximum metal-removing capacity is assured by large, hand-scraped surfaces and slides that have adjustable tapered gibs and locking binders.



6 spindle speeds . . . 160 to 1100 r.p.m. . . . can be readily selected. Rack-andpinion table feed is hand-controlled

from front or back . . . table stops have micrometer adjustments. Vertical cutterhead movement has new positive control . . . and equalized belt-tension on the heavy-duty cutter spindle is maintained regardless of cutterhead position. Table has a worksurface 26" by 6".

The Van Norman No. 6 Hand-Mill is precision-built for greater accuracy, and provides higher speeds for smoother, faster operation. It is easy to operate, saves times, and imposes less fatigue on the operator. Heavy, sturdy construction is streamlined into a handsome modern design. Bulletins are available from the Van Norman Machine Tool Co., Springfield, Mass.

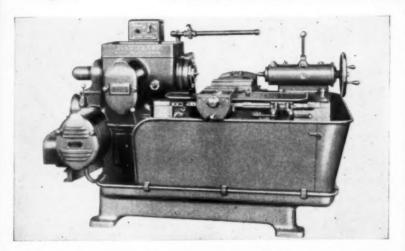
Sundstrand Automatic Stub Lathes

A smaller model 8, and a larger model 12 now supplement the line of stub lathes offered by Sundstrand Machine Tool Co., Rockford, Ill. The former resembles the model 10, introduced several years ago.

The new model 12 is somewhat larger and more powerful, with heavier feeds.

Interest centers on the Sundstrand automatic cycle control which allows quick set-ups and easy change-over. Housed unobtrusively at the left end, this control unit obviates the need of making cams and provides complete control of all cycles by the simple adjustment of dogs on a disc, as illustrated. Edge of disc is graduated, aiding in setting up cycles and changing from one job to another.

All cycles are controlled by six dogs. Three of these are standard, to accom-



modate the cycles most frequently used. The others are special and used in additional combinations for more intricate cycles. After a cycle has been set up, it can be checked easily by hand cranking.

These lathes are speedy performers. Tools approach and return at 250" a minute and feed at the maximum rate the work will stand. A skip feed dog rapid traverses the turning tools between separated surfaces except when rear slide facing is continuous. Rapid return immediately follows completion of the cutting cycle.

A wide range of action for front carriage tools is provided by three units which may be used separately or in combination. These control angular feed-in and tool relief, slow-up and dwell, straight feed-in and tool relief. With these, applications of the lathes may be expanded to meet additional cycle requirements.

Central controls, adjustable dogs, accessible pick-off gears and direct reading tables of speeds and feeds simplify operation, speed set-ups, and eliminate need for extensive training of operators. Base, pan, bed and headstock are cast integral, with thick walls and substantial ribs for rigidity. Drive spindle is extra heavy and of heat treated alloy steel, bored for draw rod and threaded at rear for hydraulic or other chuck



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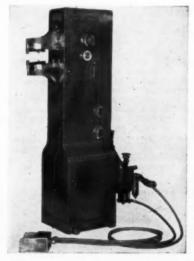
operating means. N. M. T. B. A. standard spindle nose facilitates mounting, driving and changing of work-holding devices.

Full details are disclosed in an attractive 16-page bulletin which will

be mailed on request.

Hanna High Speed Pneumatic Riveter

Speed of operation—a complete riveting stroke (forward and return) in less than one second is a feature of this new Hanna riveter.



When operated at 80 pounds air pressure, it is said to exert 20 tons pressure on the dies which will drive up to 36" diameter rivets cold and 32" rivets hot. Die stroke may be anything to a maximum of 3". It will exert its rated pressure (20 tons) uniformly upon the work even though the variation in length of rivet and thickness of grip vary as much as 36".

The driving jaws are of the "Alligator" or "Nut Cracker" type, shaped to avoid interference with the assemblies being riveted. They are of simple design and inexpensive, made of standard heat treated alloy steel bar stock. Coupled with the fact that they may be removed very quickly, any number of stakes may be kept on hand to accommodate the varying requirements of the users.

The power of the air cylinder is multiplied and transmitted to the driving jaws through a hardened and ground alloy steel wedge and anti-friction roll-

er bearings.

Operation is by a foot actuated valve which may be moved about the floor for most convenient operation. The riveter is equipped with air filter, lubricator for air supply and the mechanism is Alemite lubricated.

Further details may be obtained from Hanna Engineering Works, 1763 Elston

Ave., Chicago.



ATLAS PRESS CO., 950 N. Pitcher St., Kalamazo	e, Mich.
Please put my name down to receive new 1940 Catalog on O New 10° I O New 6° Lathe O New 7° Shaper O Presses Arbor Presses Vises.	your athes Drill
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Standard Line of Cone-Drive Reducers

A standard line of heavy duty speed reducers incorporating the Cone area-contact type of worm gearing is announced by Michigan Tool Co., 7171 E. McNichols

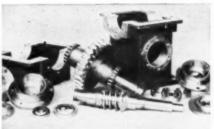
Road. Detroit.

Selection of sizes is based on the company's experience in selling large numbers of reducers on special order. In addition to the standard vertical worm-in-bottom line, other types and sizes will continue to be available on

special order.

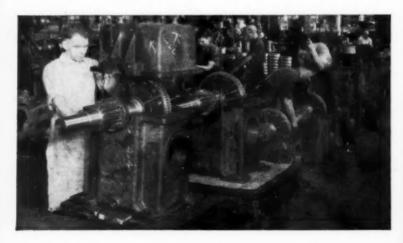
Capacity for capacity, the new units are said to be roughly 2/3 the size of standard worm gear reducers, with a proportionate saving also in The savings are due to the weight. fact that the larger area per tooth and greater number of teeth in contact with Cone worm gearing permits a material reduction in center distances for the same load capacity.

In addition, unusually high efficiencies and long life are claimed for the units. The latter is attributed to the fact that in Cone worm gearing, both worm and wheel tend to re-generate their true form in service.



turn is due to the method of generation of the worms and wheels, using hobs and cutters of identical mating capacity which finish the tooth form while running on exact operating center distance, in a manner similar to taking up of backlash.

Part of the high efficiency is said to be attributable to the lubrication characteristics of the gearing, the entering worm thread spreading oil on the contact surfaces instead of the oil being squeezed out. Also contributing is the elimination of the necessity for heat-treatment after finish machining.





R. P. M

W/70

MODEL 20-BH TOOL ROOM

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for efficient operation and dependable, trouble.-free performance over long periods.

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because of simplified modern design and quantity production.

offers Better Equipment FOR LESS MONEY.

In the complete WYCO Catalog you will find many types, sizes and styles of Flexible Shaft Machines—¼ to ½ h. p., of which a few are shown on this page. Also a wide range of Flexible Shafts and Accessories—of the highest quality—at the lowest prices. WYCO equipment offers you many advantages and superior features—improvements that merit your investigation.

Write TODAY for a copy of the WYCO catalog no obligation.

COMPARE PRICES...
WE GUARANTEE OUALITY!

Your Dealer sells the WYCO Line.

WYZENBEEK & STAFF, INC.

thus avoiding heat-treat errors.

The worms are of Chrome-Molybdenum - Nickel steel with a tensile strength in excess of 150,000 lbs. per square inch. Nickel bronze with tensile in excess of 50,000 lbs. per square inch is used for the worm wheels.

Anti-friction bearings are used throughout except for the sleeve bearings on the gear shaft in the largest units. Roller bearings are used in the gear shafts in the smaller and intermediate sizes. Worm shafts are carried in ball thrust and roller radial Bearings in the larger speed reducers.

The new reducers are said to be markedly quiet in operation as a result of the multiple tooth contact between worm and wheels. In this connection it is claimed to be characteristic of Cone drives that they tend to become quieter rather than noisier in operations, as wear corrects for minor variations.

The new line comprises models ranging from 3 in. to 15½ inch center distance, with a wide selection of standard ratios for each size. The rugged housings are of high tensile nickel iron.

Preston Spray Wheel

A patent covering a spray wheel has been granted by the U. S. Patent Office to E. A. Preston, of the engineering staff of D. J. Murray Mfg. Co., Wausau, Wis., and has been assigned by him to that company. The patent

covers 20 claims for new design and construction of the unit that is adaptable to many uses in addition to air washer.

Thermoguard Protection for Small Motors

. Thermoguard, a simple little automatic watchman for protection against burnout in almost any type of fractional horsepower motor, is described in a new booklet announced by Westinghouse.

The device protects against motor failures caused by continuous overloads, frequently repeated overloads, jamming of motor drive, inability to start because of low voltage, inability to run because of low voltage, excessive temperatures and failure of ventilation.

Three types of Thermoguard meet every need:—fully automatic, interrupting the circuit automatically when motor temperature for any reason becomes abnormally high and restarting the motor automatically when temperature is safe; manual reset, which must be reset by pushing button; and automatic time-delay, for applications such as oil burners with intermittent ignitions. The latter recloses automatically after a delay of at least three minutes.

Copies of booklet F-8490 may be obtained from department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh. Pa.



Elimination of costly cam dies for piercing sheet metal, through the use of standardized individual punching units mounted on fixtures in multiple—is an important development in connection with forthcoming 1940 car models. The illustration shows assembly and final inspection of units at Progressive Welder Co., Detroit.

FREE!!

30 Day Trial Offer

We know that the MODERN COMBINATION DRILL TABLE will save its cost in time and labor-at least every six months. That's why we're anxious for you to make your own test, on difficult jobs right in your own shop. If you're not thoroughly convinced within 30-days that it will save you time and money on difficult drilling jobseliminating awkward blocks, clamps or plates -avoiding chance of accident and injuries in holding jobs by hand-then send it back and we will pay the freight both ways.



Test It In Your Own Shop



Two typical jobs are illustrated. They're easily and quickly handled with the MODERN COMBINATION DRILL TABLE . . . difficult and troublesome if done with the usual improvised blocks, clamps or plates. Think of the time lost annually on similar jobs in your plant . . . and don't overlook the constant chance of accident where the work is held by hand.

MODERN COMBINATION DRILL TABLES are available for every drill press. Write TODAY for complete information on the Table-and Our Free Trial Offer.

We also manufacture the MODERN CUTTING-OFF MACHINE.

MODERN MACHINE TOOL CO., MICHIGAN

Timesaver

Produces Perfect Fits Quiet Operation



A gear lapped to precision, in assembly, with Timesaver Compound

Save Money by eliminating hand scraping and running in operations.

Can be used on any type of surface. Will not imbed in the metal.

Manufactured in softand high grades, each grade obtainable in fine, medium, and coarse.

Used by leading manufacturers for the fitting of all types of gears, bearings, valves, pistons, slides, etc.

Send for free samples and literature on your letterhead.

TIMESAVER PRODUCTS CO.

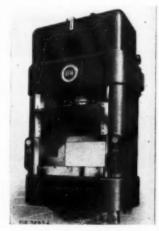
33 S. Desplaines St., - Chicago, III.

H-P-M Fastraverse Presses

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, announces another new "Smooth - Line" double - action platen press for the sheet metal working in-

dustry.

It has two separate hydraulic pressing members:-the main slide, and the die cushion platen located underneath the bolster plate. The main slide is actuated by a double-acting piston type ram working in a smooth-bored steel cylinder. Directly connected to this main cylinder, without operating valves, is the Hydro-Power Radial Pump. The main ram movement is controlled through regulation of the pump output, which is both variable and reversible. Thus, by the application of the H-P-M Closed Circuit, the press operates rapidly without shock. Fast closing and opening speeds are accomplished by the patented H-P-M Fastraverse system.

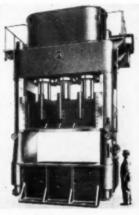


The massive construction, including deep, long gibbed main slide and the extremely heavy steel bolster plate make this press suitable for the most accurate type of sheet metal work.

The other new model is a self-contained hydraulic Fastraverse double-action press which offers a dual range of working pressures and speeds, thus

constituting virtually two presses in a single frame. It was designed for sheet metal drawing of large products.

The long main slide has a new H-P-M gib guiding design which contacts the uprights at eight different points instead of the usual four.



There are two separate pressing members:—the main slide, and the die cushion slide. The main slide is actuated by three main rams located in the press head. For heavy pressure service, all three rams are employed. For lighter work only the central ram may be used, with faster action under load. This change-over from three ram to one ram operation is accomplished through a selector valve.

The second pressing member is the die cushion slide located within the press bed. No additional power equipment is necessary to operate this slide as this second pressing action receives its working pressure from the press operating system. The die cushion slide is also gib guided, completely carrying out the plans of precision accuracy. The pressure of this die cushion can also be adjusted to meet the pressure requirements necessary.

Following the popular new "Smooth-Line" styling, all piping, gauges, linkage and operating stations have been built into the press frames.

Two-Voltage, Multi-Speed Capacitor Motors

Providing single speed operation with the ordinary on and off switch for either 110- or 220-volt circuits, with an inexpensive two-speed switch giving high and low speed operation and with a speed controller giving multi-speed operation with either voltage, a new motor announced by Westinghouse fulfils the requirements it formerly took three to six different motors to meet. This motor comes in 1/20- to ¾-horsepower sizes.

Special sleeve bearings absorb shocks imposed by propellor fans, and large oil reservoirs packed with yarn insure adequate lubrication. Oversize shaft between bearings reduces bearing wear and vibration and maintains constant air gap. A ventilated rotor gives cooler running, and annealed laminations reduce power losses.

Additional information may be obtained from department 7-N-80, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

SIMPLEX DRILL PRESS & MILLING MACHINE VISES



Made in 3½ and 6 inch sizes with screw fitted in replaceable bronze bushing. Large size has hardened and ground jaws.

Write for literature and name of nearest dealer.

The Desmond-Stephan Mfg. Co. URBANA, OHIO

Die Production

For many years, dies have been made by drilling a series of holes in the steel pieces and knocking out the renters. After that remained the arluous task of filing to size and hand stoning to a proper finish. Sometimes when a die was hardened before finshing, it was too hard for economical performance of the hand stoning finishing operation. When hardened after finishing, there was always danger of warpage and breaking down of decarburized surfaces,



Boyar-Schultz Corp., as experienced builders of dies understood these difficulties, and to help overcome them, developed the now popular portable profile grinder, No. 1.

The portable model was so successful in operation that a new heavy duty profile grinder was developed. Designed for larger, heavier work, this new high speed precision machine handles a wide variety of internal and external shapes — dies, punches, cams,

templates, cutters and other difficult irregular shapes.

The table of the new grinder is 18" x 24". It is degree graduated and tilts 10 degrees either way from horizontal. The high speed reciprocating spindle runs at approximately 10,000 r.p.m. with vertical oscillations of 100 per minute.

An overarm spindle attachment has been developed for grinding base punches and other parts requiring vision from above. Unique construction permits vertical motion in the spindle. It handles the same range of mounted wheels used in the lower spindle.

A four page bulletin gives complete information and may be had by addressing Boyar-Schultz Corp., 2108 Walnut St., Chicago, Ill.

Continental Issues Bulletin

An interesting eight-page bulletin shows various types of round, out-of round, flat, tapered, tubular and irregular contoured work being polished and buffed by the new semi-automatic polishing and buffing heads for use with Double Spindle Lathes made by the Continental Roll & Steel Foundry Co., Industrial Equipment Division.

Also described is the Continental composition applicator for semi-automatic equipment and Continental Tube Burring Machines, Tube Bending Machines and Tube Mills which fabricate tubing from cold rolled strip.

Copies of this bulletin are available upon request from the company at 14400 Railroad Avenue, East Chicago, Indiana.

Centerless Grinding

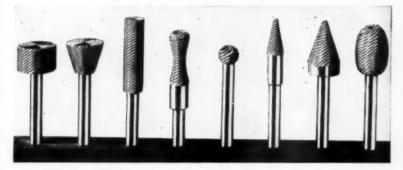
Precision, Accuracy, Promptness

Let us quote on your specifications.

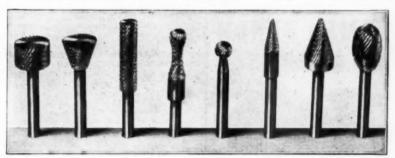
THE HEIM COMPANY
Fairfield, Connecticut



FORD HAND CUT ROTARY FILES



GROUND CUTTERS—Ground from the solid after heat treating



FORD Hand Cut Rotary Files and Rotary Ground Cutters available in all our standard shapes as well as in thousands of special shapes.

Write for full information.

413 PERSHING AVE. M. A. FORD MFG. CO. DAVENPORT, IOWA

Midwest Sleeves and Sockets

Midwest Tool & Mfg. Co., 2360 W. Jefferson, Detroit, which has manufactured a complete line of metal cutting



AMES BENCH LATHES



Precision lathes for doing most accurate turning, drilling, milling, threading, filing, polishing, in the tool room or in production.

Send for Complete Information

B. C. AMES COMPANY WALTHAM, MASS.

tools for 30 years, announces the addition of a full list of hardened and ground sleeves and extension sockets for milling machines, drill presses, etc. Because they are hardened and ground with modern precision methods, it is asserted these new sleeves will reward the user with much greater durability and length of life than the usual soft reducing sleeve. These are available in 7 groupings of 101 different combinations of B. and S. and Morse Tapers and with either the tang end or tapped for draw bar. Being precision ground, the concentricity of the inside and outside tapers is always assured. Bulletin 16-J which gives complete information is available upon request.

Elastic Stop Nuts

Elastic Stop Nut Corp., 1015 Newark Ave., Elizabeth, N. J., announces that, in addition to its standard line of selflocking nuts, these nuts can now be furnished on order in any metal and in any combination of style, size, and thread system. Elastic Stop Nuts incorporate a resilient non-metallic collar which takes up thread play, thus establishing a constant thread contact which holds the nut in position on the bolt regardless of vibration or wear of surrounding parts. Developed originally for pneumatic tools and other apparatus subject to heavy vibration, they are now widely used on mechanical equipment in every industry. Catalog, with graphic explanation of the Elastic Stop principle and listing the standard nuts available, will be sent upon request to the manufacturer.





New STOW Junior

FLEXIBLE SHAFT

For as little a

\$35.00

Featuring Quality at a LOW Price

The new STOW Junior is compact, light-weight, perfectly balanced, sturdily-constructed and low priced! It is a wide-utility Flexible Shaft Machine that you can depend on, for it is a worthy companion to the famous "STOW" Heavy-duty unit. From this well-known quality construction, various features of this new popular price line have been patterned.

Careful designing of each unit for its specific requirement, plus manufacturing economies through standardization and increased volume, have made possible lower prices—under a quality policy which has built STOW'S reputation since 1875.

Write direct for full details of STOW'S VALUE achievement — the new Junior line. We will

line. We will send you the name of your nearest dealer.

WIDE LIST OF USES

GRINDING
FILING
FILING
SANDING
SANDING
POLISHING
BUFFING
DRILLING
For almost every
type of industry.

STOW

30 Shear St. Binghanton, N. Y.

Established since 1875 — Inventors of Flexible Shafts

Complete with motor, switch, extension cord and plug, flexible shaft and clamp spindle.

*Rugged oversize flexible core; tough, oil-resistant rubber outside casing.

*Motor-end of shaft reinforced to insure

uniform curvature. Oilite bearings.

*Hand piece: ball bearings, labyrinth oilseal. Removable Clamp Spindle.

Also manufacturers of Stow Heavy-Duty Flexible Shaft Machines for high-volume production operations.



Pedestal Type . . . Suspended Type . . . Combination Type . . . Multi-Speed Type. Full line of attachments.

Standard Precision Grinders

Standard Type BPA Precision Grinders, developed by The Standard Electrical Tool Co., 1954 W. 8th St., Cincinnati, Ohio can be furnished for both internal and external grinding by means of interchangeable spindle units. These grinders are available in sizes ranging from ½ to 10 h. p., for application to lathe, planer, boring mill, milling machine, etc.

Power is transmitted from the motor to the grinding spindle by means of a belt drive, which insures obtaining the correct peripheral speed on the grinding wheel. The wheel overhangs the front of machine causing a minimum of interference with the work. Grinding on centers is accomplished by means of vertical hand adjusting screw for raising or lowering the spindle assembly.

Either an open or an enclosed type of internal spindle assembly can be furnished, these being interchangeable and available in various lengths to meet diversified requirements.



One of the important features of this equipment is the ease and speed with which the change from external to internal grinding can be made. The spindle assembly is held in position by two clamp screws and can be removed from the housing as a unit. A slot in the spindle housing accepts a dowel on each spindle unit, assuring a definite location for the spindle; thus, the change is completed with a minimum of effort and time.

Bulletin 162 illustrates and presents a full description of these useful grinders.



Blank & Buxton Machinery Co.

JACKSON, MICH.

POWER DRIVEN FORGE HAMMERS Formerly the Mayer-Moloch Ham-

Formerly the Mayer-Moloch Hammer-made in 5 sizes, belt or direct motor drive-25 lb. to 500 lb. ramextremely powerful, simple design. Write for details and prices on hammers or any repair parts.

D. J. MURRAY MFG. CO. Wausau, Wis.

Established 1883

MARSHALLTOWN No. 0 BENCH PRESS

The Marshalltown line includes Inclinable Presses to capacity of 70 tons. Send today for literature and prices.



★
Inclinable

★
Open Back

★
Heavier
Construction

An Outstanding Marshalltown Value!

Here is a precision-built Bench Press that is built and engineered to give real service on production schedules. Its features include more die space and easier adjustment, improved ball and socket connection, convertible clutch for single stroke or continuous operation.

MARSHALLTOWN MFG. CO.

900 East Nevada St.,

Marshalltown, Iowa

Internal Grinding Attachment

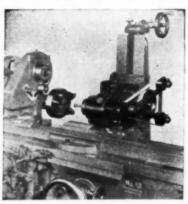
Developed for use with the Brown & Sharpe No. 13 Universal and Tool Grinding Machines, this attachment is designed for rapid and accurate stock removal during the course of an unusually long life.

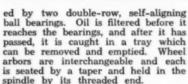
The tapered, cartridge-type spindle unit is carried in a sturdy body casting which is mounted on a knee secured to the front of the wheel slide

Send for Illustrated bulletin No. 100.

age. Got exact to mporature of work in furnace. Direct reading; no calculations; no maintenance expense. Strictly automatic. Range 1000-3600° F.

of the machine. The spindle, driven from the machine spindle by a canvas belt, runs at 27,000 r.p.m. and is support-





The capacity ranges from holes with a minimum diameter of ¼" and maximum length of 1" to holes with a minimum diameter of 7/16" and maximum length of 2". A 4-jawed chuck, with jaws independent and reversible, is furnished with the Attachment.

For further details please address Brown & Sharpe Mfg. Co., Providence, R. I.





McMAHON Adjustable Angle Plate

FRANK McMAHON CO., 142 JUNE ST.

SHE SLIPPED



IS OFTEN SWEET MUSIC IN TRANS-MISSION JAMS.

It may mean that the machine, the product, the operator and his wife and children have been saved.



THE CONWAY CLUTCH CO. will announce a short time hence, its new line of SLIP and OVERLOAD RELEASE clutches - plate type.

THE CONWAY CLUTCH CO.

Manufacturers

1541 Queen City Ave., :-:

Cincinnatt Obic

Light Weight Welding Gun

What is believed to be the lightest weight 'pincher' type welding gun is announced by Progressive Welder Co., Detroit. Hydraulic in operation, and designed for welding currents up to 50 kva., and welding pressures up to 1,000 lbs., the new gun is built almost entirely of magnesium.

Weighing but a few pounds, it may be manipulated with one hand, if desired.

In the new gun, current is transmitted by sliding contact to electrodes directly through the pressure cylinder and piston, the latter being built into the gun.

A 'cocking' action of the piston within the cylinder, increasing with welding pressure, is said to insure continuous contact of the sliding members and eliminate any tendency to arc.

The electrodes travel in a straight line toward and away from the work, instead of the usual arc, thus providing more accurate heating of the spots, and insuring more complete contact of electrode tips with the work.

Cooling is effected by means of two water circuits. One stream is circulated through the sliding contact head and to one electrode, while the other cools the lower electrode and its welding point.



The gun is available in C-type, Scissors, Yoke, and a variety of special types to fit all pinch type spot welding requirements.

With the introduction of this new gun, Progressive now offers a complete line of light-weight guns, covering every type of spot-welding requirement, including various forms of expansion and push guns, etc.



MODERNIZE present equipment with a RUSSELL BORING BAR. Bores 9.16* to 12* dia. with boring axis parallel to shank axis. One compact tool, with micrometer adjustment.

RUSSELL BORING BAR CO. MIDDLETOWN, OHIO

GRIND THE EASTERN CENTERLESS WAY

ACCURACY-FINE FINISHES-LOW COST Large or Small Lots

EASTERN CENTERLESS GRINDING CO. 624 Capitol Ave., Hartford, Conn.



AUTOMATIC RIVET SETTER

For radios, switches, toys, electric parts and appliances, auto parts and accessories, and other small ries, assemblies.

Adjustable
CENTERS

Sets 1 or 2 rivets at a time

Mill give you vol.

Will give you vol.

Savings even on short assem.

Centers adaptable to 6°. For setting rivets up to 1/4" body diameter. Bench and pedestal types.

No obligation for assembly analysis. Send sample or blueprint with inquiry.

CHICAGO RIVET & MACHINE COMPANY

1855 SO. 54th AVE. (Cicero P. O.) CHICAGO, ILLINOIS

Lincoln Offers a New Small Welder

A new small are welding machine is announced by The Lincoln Electric Co., Cleveland, Ohio. Known as the "Shield-Arc Junior" the new unit has been built for use in conjunction with an engine or electric motor drive. Direct coupled to a gasoline engine or belted to a power take-off from an engine, or connected by belt to line shafting or an electric motor, this welder generates a smooth current for a wide variety of arc welding applications. Typical profitable uses for this machine include: light-gauge metal such as automobile fenders; galvanized sheet; repair

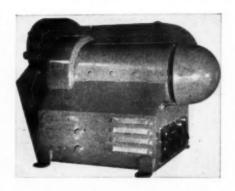
of cast iron parts such as engine blocks; fabrication of angle iron and plate parts and structures; hard facing of plow shares and other wearing parts and repair of miscellaneous farm implements and machinery. It can be used with either bare of shielded arc

type electrodes.

It is rated at 200 amperes and its current range, welding duty, 30-volt arc, is 60 to 250 amperes. The machine is 29%" long over pulley, 18" high with a base $15\frac{1}{2}$ " x 19%". The net weight is 320 lbs.

The outstanding feature is the system of voltage and current control, known as Dual Continuous, now available for the first time on a small beltdriven model. It permits independ-ent adjustment of voltage and current, giving complete and separate control of arc heat and arc penetration for easy, speedy welding of any job. This is essential for best quality welding and maximum welding economy in the varied applications in which the machine can be profitably used. The ability to vary voltage and current independently of each other enables the user to get just the right size and type of arc for every job, whether it be for light sheet metal work or fabrication of heavier materials.

Equipped with Class B (non-inflammable) insulation, at the proper points,



the "Shield-Arc Junior" can be operated with relatively large size electrodes at high average current without danger of burning out, thus permitting faster, sustained welding at lower cost.

The generator is single operator, variable voltage type with laminated pole pieces. The generator armature is mounted on a large shaft with pulley. Construction is arc welded steel, dripproof. The welder is fitted with four steel feet welded to the base and drilled for bolting. The machine occupies a space less than 2 feet square. New "Shield - Arc Junior" 200 ampere welder for belt or direct drive announced by The Lincoln Electric Company, Cleveland, Ohio.

STOP RUSTING

Protect highly polished parts in storage or transit with B *U *C *O Green RP Rust Preventative. Easily applied by brushing, spraying or dipping. Easily removable with gasoline or naptha.

Write for full details and price.

C. G. BUCHANAN CHEMICAL CO. Station H, Cincinnati, Obio

Page 71

IPLE SPINDLE TAPPII

MULTIPLE SPINDLE TAPPING AND DRILLING HEADS

Etter - Emrick

"EVERY PART IN STOCK EXCEPT THE HOLES"



A STANDARDIZED SYSTEM

ETTCO MULTIPLE HEADS are manufactured. Hundreds of cases—thousands of gears are in stock. Delivery service is at times within 24 hours.

They are made up of interchangeable units. The ultimate cost of the heads is the lowest of any made.

Your manufacturing is 100 to 500% faster and a better job.

Small multiple tapping is a new art. We'll engineer your job and show you how to tie the head to

fast work holders for the ultimate in production and accuracy.

Let us have a drawing or part for quotation.

ETTCO	TO	OL	CO.	
594 JOHNSON A	VE.	BROO	KLYN, N. Y.	

Miller Offers New Welder

What is claimed to be an entirely new design in A. C. welders is announced by Miller Electric Mfg. Co., Appleton, Wis. The amperage, voltage and reac-tance control are all in one dial, placed at an angle and the right height on the front of the cabinet so that the operator can change the dial without stooping to see the amperage markings. When he selects the amperage desired, the voltage and reactance change automatically. The new welder is shown without welding leads that are easily detachable. The case is of all-steel arc welded, and designed to furnish adequate ventilation without an open top, so that no metal, dirt, tools, or water can fall into the electrical wiring. The finish is durable baked-on enamel. The transformer is designed so that it will not heat surrounding metal parts, and it is of heavy duty type with air-cooled coils. Is said to hold its rated output regardless of temperature of welder. Built in four models to meet require-



ments—165, 200, 250, and 300 amperes, each welder comes completely equipped with 20 feet of welding leads, headshield, electrode holder, clamp type ground and assortment of welding electrodes.

THE DIAMONDS IN CARBOLOY DRESSERS NEVER FLY OUT OF

Do YOUR Diamonds

Have Wings? /

The diamonds in Carboloy Dressers can't come loose. They are actually "wetted" to a special matrix and permanently held in place. With Carboloy Dressers you eliminate all remounting expense—and save at least 25% on dresser costs on all rough, semi-finish and finish dressing jobs. Send for Catalog DR-38.

THE MOUNTING

CARBOLOY CO., INC.
11138 E. 8 Mills Rd., Setrolt, Mich
Chicage - Cleveland - Newark
Philadelphia - Pittsburgh - Warcester

DIAMOND IMPREGNATED WHEEL DRESSERS

Quenching High Carbon Steel

Numerous manufacturers of high carbon steel are quenching the heated metal in a calcium chloride brine solution according to The Dow Chemical Co., Midland, Mich. These manufacturers claim this solution to be superior to quenching in plain water since it removes the scale developed during the heating process and eliminates the possibility of soft spots.

According to Dow, the manufacturers who are purchasing Dowflake Calcium Chloride for this purpose, use an 18-20% solution which is kept at a temperature of 80° F. The hot steel, at a temperature of about 1550° F iguenched in this solution, then taken by conveyor to a cleaning bath where the calcium chloride solution is washed off in preparation for painting.

Eyes Are Expensive Targets

The National Safety Council published a book during 1938 called "Accident Facts." According to this report it cost this country 000,000 for occupational accidents. An anal-ysis of the costs showed that 5.31% of this amount was paid for eye accidents. A recent survey shows about thirty million people are employed in industry. This figure includes those who work in offices as well as in shops.

Five per cent of the total amount paid for occupational accidents was in excess of \$37,000,000. Dividing that by the number of people employed (thirty million) the cost per worker per year for eye accidents i s

\$1.23. It may be possible to go through one year with a cost below this, but the law of averages will square the account unless adequate eye protection is provided in the meantime. This figure of \$1.23 justifies the statement that you pay for goggles whether you buy them or not.

Here are some figures that will interest those who are self-insured. The average compensation and medical cost for an eye injury is \$345. This is money

BROWN & SHARPE

- Booth 5310 Cleveland
 - -for Rotary and
 Rectangular Model
 Magnetic Chucks
 Permanent Magnet Type





BROWN & SHARPE MFG. CO. Providence, R. I.

Providence, R. I. U. S. A.

actually paid out by insurance companies for medical expense and for compensation to workers who have had eye accidents. The average cost of compensation and medical for all other accidents, excluding eye injuries, is \$1.94.

*From an address by K. R. Sutherland in Detroit; published in booklet form by American Optical Co., Southbridge, Mass.

Stanley Metal Cutting Mitre Box

Stanley Tools, New Britain, Conn. announces a new Metal Cutting Mitre Box (No. 230) for installers of metal mouldings and trim. Its capacity is $2\frac{1}{4}$ in. high x 3 in. wide.

It will cut aluminum or white metal, monel metal, brass, bronze, steel, stainless steel, wood, plastics or any material that can be cut with a hack saw. It is particularly handy because it is light in weight and can be carried to the job where most of the cutting is done.

The Box is all steel and has durable cast iron saw guides reinforced with steel. The saw guide posts are of a new "snap-on" type, ground to fit into the saw guides. The "snap-on" feature permits removing the posts so that the hack saw can be used independently of the box.



WADE Knurling Tool

For knurling long or slender work ... easily and quickly, without any bother of adjusting it in the tool post. Knurl is fed into work by the screw on handle. Plunger carrying knurl is keyed so it cannot turn. Tool is 7° long. Maximum capacity is 34° diameter. Minimum capacity 32°.

Write for full details,

WADE TOOL CO.

ALSO WADE BENCH LATHES AND HAND KNURLING TOOLS



A hack saw frame with a 12 in. x 32 tooth quality steel saw is furnished with the box. Angles of 90 and less, right or left, can be cut. A sliding front guide, securely held in position by a clamp bolt and wing nut is used to obtain the different angles. The degree scale is accurately and clearly marked.

For accurate cutting of various shapes of mouldings it is necessary to support the moulding with wood filler blocks. Two wood filler blocks, which are furnished with the box, will support a number of common shapes of moulding and trim. Adjustable thumb screw clamps on each side of the box hold work tightly.

Ledaloyl Catalog

Last year Johnson announced Ledaloyl bearings, and report that satisfactory installations have been accomplished in every branch of industry.

At the outset, it was noted that a considerable number of users wanted to buy in small quantities. To serve this class of trade was at first difficult because of the tool and die expense involved in each case. This condition has been changed and they can now supply from stock, over 300 individual sizes.

Offering this new service to industry they have published a catalogue, dealing exclusively with Ledaloyl. Complete size and price information are included therein together with complete installation data.

Copies of the catalog may be had by addressing Johnson Bronze Co., New Castle, Pa.

Bulletins By Bryant

Four large and especially attractive bulletins have just been published by the Bryant Chucking Grinder Co., Springfield, Vt. Many operations—a number of new, as well as conventional uses, of Bryant grinders are pictorially described and presented in a clear, concise and easy-reading style.

One bulletin describing Bryant Grinders Series 16, printed in yellow and black, contains 24 pages and includes numerous specification charts and operations possible on the machine. Another bulletin with an attractive light blue and black cover contains 26 pages devoted entirely to Bryant Grinders series 5. A 40 page catalog with a ring binding, facilitating easy reference, contains interesting information concerning the Bryant single slide internal and hole and face grinders.

Bryant Production Data is the fourth bulletin in this series.

LONG STROKE-

-LOW PRICE

No. 0 Rousselle - - - \$100 No. 1 Rousselle - - - \$150



Big presses are for big jobs...it is inefficient, extravagant and wasteful to use them for Rousselle jobs... especially when you consider the low first cost and low operating cost of Rousselle Presses. These speedy, versatile units give you increased capacity with small investment and leave the big presses free for the big jobs.

The No. 1 Rousselle is designed for trimming deep die castings and other deep draw work—jobs that previously demanded big presses beceuse of the long stroke needed. With automatic feed, 10,000 operations per hour are possible. NON-REPEAT clutch stops after each stroke, or can be set to operate continuously.

Check These Specifications:

W	eight ankshaft diameter at main bearings	450-lbs.
C	ankshaft diameter at main bearings	41
Di	ameter of crankshaft	11/4"
Fl	ywheel weight	120-lbs.
Sr	oed	300-г. р. т.
Di	ameter of flywheel	161/2-inches
R	m standard stroke	2-inches
A	ljustment of ram	2-inches
Si	ze of bottom of ram	3x33
Ra	m to bed; stroke down adjustment up ze of hole in ram for punch	61/2*
Si	ze of hole in ram for punch	11/4"
Be	d size	8x12*
	epth of throat to center of ram	
	ze of opening between press frame at back	
În	clinable angle from right angle	30-degrees
H	eight	36-inches
Th	ickness of bolster plate	1-inch

Write TODAY for Bulletin giving full details.

DAVID J. ROSS & CO., BENTON HARBOR.

with a readily removable motor of

standard NEMA frame size to drive

Ideal Variable Speed Lathe

Of particular interest to manufacturers producing parts requiring grinding, lapping, filing, or polishing, is the announcement by the Schauer Machine Co., 2064 Reading Road, Cincinnati, Ohio, of the addition to their line of a variable speed lathe.

The new type VA1B Ideal Lathe provides a polishing head with infinitely variable spindle speeds of 75 r.p.m. to as high as 6350 r.p.m. The range of variation is approximately 6.8 to 1 with a single speed motor, and 14 to 1 using a two speed motor.

Of simple and rugged construction, the lathe is totally enclosed, equipped

the spindle. Variation in spindle speeds is accomplished by the use of a vairable pitch pulley between the meter and spindle with standard length, easily replaceable V belts, for Interconnecting the driving and driven parts. Standard equipment includes am automatic braking system for quickly stopping the spindle and a three jaw universal chuck for holding the work. A 1" clear hole is provided through the spindle.

Speed of the spindle may be changed from maximum to minimum, by the simple movement of a conveniently located hand lever, without stopping the lathe.

Adjustments for belt tension are provided in an easily accessible, adjustable bushing located on the speed control lever, both belts being adjustable simultaneously.

Built for bench mounting, the new lathe has an overall length of approximately 26½", width of 11½" and height of 16 3/16", and occupies a bench space of 11 x 18".

Complete engineering service for adapting the new lathe to individual production needs can be obtained by addressing the makers.



The table below was compiled from figures in the machining of S.A.E. 1045, a typical carbon steel in common use. Note that in this instance KENNA-METAL cuts from 3 1/3 to 5 5/7 times as fast, with 2 3/5 to 6 times as many pieces per grind, and removes 60% to 174% more stock per minute.

	High Speed Steel	Cobalt Chrome Alloy	KENNAMET
Speed (ft./min.) 70	120	400
Food (inches)	.0625	.0625	.030
Pieces per Grind		25	60
Depth (inches)	5/16	5/16	5/16
Stock Removed	16.40	28.00	45.00
(cu in /min)			

KENNAMETAL will machine steel heat-treated to 550 Brinell while combining roughing and finishing in one operation. Write today for catalogue; also new chart of "Materials Machined with KENNAMETAL."



NOPAK means No Cost-

- 2. For MAINTENANCE



3 and 4-Way Foot Operated



3 and 4-Way Hand Operated

No Wasteful Air Leaks—

NOPAK Patented Disk and Seat Design means wear-proof, leakproof valves. Sealing surfaces actually improve with continuous

 No Maintenance Expense NOPAK Packless Construction eliminates stem leakage . . . the source of most valve maintenance costs.

NOPAK'S exclusive patented features also Protect Disk and Seat from dirt and grit; give Full Pipe Area through Valve and utilize Line Pressure to Seal Valve at all times; permit Thrust or Throttling Action as desired.

NOPAK Valves for Air, Oil, Water and other Fluids are all built on the same basic principles, assuring you of highest efficiency regardless of their application.

For the Complete NOPAK Story ask for Bulletin 65

Galland-Henning Mfg. Co. 2754 So. 31st Street

Milwaukee, Wis.

NOPAK 2, 3 and 4-WAY VALVES



Timesavers for Your Plant



Speedy, economical tools for finishing, lapping and polishing small parts. Hand or foot operated collet, sizes from 1/64 to 114. Hand, foot or air operated 3-jaw chucks. 1, ½ or ½ h. p. A. C. 2-speed motor.

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SCHAUER MACHINE CO. 2064 Reading Road, Cincinnati, O.

Are You "Penny-Wise"?

A small investment in

WALTON TAP Extractors

will insure against most of the Loss and Delay caused by Broken Taps.

No annealing, drilling, or damaged threads.

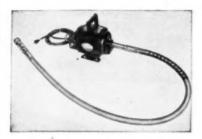
Ask for Folder 132 listing stock sizes, styles and prices.

Each Tool Must Sell Itself

THE WALTON CO.
95 Allyn St., Hartford, Conn.

Stow "Junior" Flexible-Shaft Machines

Expansion of the Stow "Junior" line of flexible shaft units to include a Com-



bination tool has just been made known by Stow Mfg. Co., Inc., 30 Shear St., Binghamton, N. Y. This new model AJ machine consists of motor, flexible shaft, clamp spindle and extension cord and plug. The new Stow "Juniors" are being introduced at lower prices, as the result of standardization of design and manufacturing economics due to greater volume. Stow output this year is showing a 92% increase over 1938.

The "Combination" model is for bench and portable use, being fitted with conventional base and also with carrying handle. With its compactness and light weight, the tool can be operated in close quarters, wherever a workman himself can go. Its principal application is to grinding, light

BURR KEYSEATERS



Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work,

Made in 4 sizes, for hand or motor operation.

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A Machine Motorizing Unit

For motorizing all types of machines that require from 1 to 5 H. P. motors.

The Drive-All unit is made in three and four speed models. Speed control is by a convenient hand lever—there are no belts to shift. The sturdy transmission gears are mounted on ball bearings, for smooth, quiet running—and operate in an oil bath.

Send TODAY for bulletins giving full information on these efficient and inexpensive units.



SPEEDS AT YOUR FINGER TIPS

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3401 CONNER AVE. - DETROIT, MICH.

AT-THE-JOB "STOCKROOMS"

Cost Nothing to Build, Move or Change!

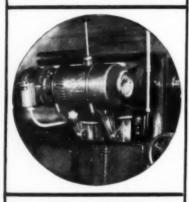


Stackbin sections give you a convenient stockroom—wherever you want it—whenever you need it. These prented sectional storage bins nest together without bolts, screws or complicated fastenings—anyone in the plant can assemble them quickly and easily.

Convenient stock facilities can save time —labor—money. Find out today how Stackbins can lower *your* handling costs. Write to Stackbin Corp., 55 Troy St., Providence, R. I.

STACKBINS
"STACKED AND STILL ACCESSIBLE"

AT YOUR COMMAND



4 SPEEDS

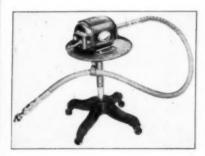
Shaper operation is made more flexible — more efficient with a SCHULTES Four Speed Drive—with just the right speed for the job—at Your Finger-Tip.

The modern drives are equally valuable for lathes, milling machines, drills or punch presses. They're low in first cost and easily attached. Soon repay their cost through savings which they make possible.

Schultes Drives incorporate all the latest engineering improvements and advantages. They're dependable, economical to operate and maintain, and will show definite savings in production costs.

Write for bulletin giving complete information

Westlof Tool & Die Co. 428 Bellevue Ave., Detroit drilling, polishing, sanding and filing operations. The same attachments are available as furnished for Stow Heavy-Duty machines. The motor equipment offers four options:— ½ h.p.—1750r.p. m; ¼ h.p.—3400 r.p.m.; 1/3 h.p.—1750 r.p.m.; and ½h.p.—3400 r.p.m.



The "Junior" line also includes a pedestal type. It incorporates motor, extension cord and plug, flexible shaft and clamp spindle. Connection can be made with any light socket. Mounted on a 4-leg metal base with ball-bearing casters the unit is steady and easily pushed about. The pedestal is adjustable in height and maintains a low center of gravity. It carries a convenient tool tray. Standard Stow attachments used on the heavy duty models are specified for the Stow Juniors also.

Doall Digest

The latest issue of this new Digest contains information of interest to every alert Plant Manager. There is a comprehensive review of the wide range of machining operations possible with the Doall, the most noteworthy of which is the production of short run stampings without dies. A complete explanation of this economical process is given on the last three pages of the Digest.

Copies may be obtained by addressing Continental Machines, Inc., Minneapolis, Minn.

Mechanics Through the Ages



CLIT THE HARDEST STONE
WITH TWO HANDED IRON SAWS

PITTED WITH JEWELED TEETH

NOW TURNED OUT BY PLANERS WAS DONE IN THE CLD DAYS BY CRAFTSMEN USING ONLY CLUMSY, BROAD-FACED HAMMERS AND COLD CHISELS. WITH THESE TOOLS, MASTER-MACHINISTS OF THE EARLY 1800'S TACKLED LARGE FLAT SURFACES, SUCH AS VALVE FACES AND SEATS, LONG AND ACCURATE GUIDES AND LATHE SHEARS. MEN SPENT LIFETIMES PERFECTING THEMSELVES IN THE USE OF HAMMER AND CHISEL, ALONE

WHEN A WOOD

PULLEY WORE OUT IN THE OLD TIME MACHINE SHOPTHE MAINTENANCE MAN SIMPLY PICKED ROM THESHOP WOODPILE A LIKELY PIECE OF LUMBER AND SET TO WORK WHITTLING OUT THE PULLEY HIMSELF.

Dickerman Demagnetizer

A new demagnetizer is announced by H. E. Dickerman Mfg. Co., 284 Wilbraham Road, Springfield, Mass.

It was developed primarily for demagnetizing the newer tool steel alloys, such as High Carbon High Chrome Steels and the very new types of Molybdenum Steels, properly and fast at low cost. It also handles the regular run of steels as well.

Certain electrical and magnetic properties not usually employed in such equipment are said to be incorporated in this Demagnetzier. Bearing manufacturers find it particularly useful in demagnetizing small assembled ball or roller bearings up to about 4" D. D. and 2" thick.



The unit is about 6½" x 5½" x 4½" deep. The two poles are 3" x 1½" and are spaced ½" apart. A generous length of rubber covered cord is attached with a plug for connecting to the 110 Volt A. C. supply from 25 cycles to 60 cycles. Its weight is 11½ lbs. net. The case is ¾" thick solid mahogany, finished natural and a heavy brass cover fits over the poles. A push button operates the Demagnetizer and it shuts itself off after using.

Although small in size, this does not limit its capacity. Dies and punches of all sizes can be demagnetized and where the job is too heavy to place on the Demagnetizer, the unit itself can be placed over the die or tool.



Ask for a 10 DAYS FREE

TRIAL, Our 1 HP 2 SPEED BLOWER and suction

CLEANER (illustrated) will

solve the most cleaning problems.

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DON'T THROW AWAY VALUABLE CARBIDE TIPPED TOOLS S S S

 Write at once for our folder on CARBIDE TOOL SALVAGE.

Tips Remounted—Shanks Retipped—Round Tools Expanded to Size—Grinding—Lapping.

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SUPER TOOL COMPANY

21650 Hoover Rd.

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National Safety Congress

A chair or stepladder slips—and a fellow in Dubuque or Davenport has a fall.

Thinking of the ball game or a Sunday trip, a machinist in Detroit absentmindedly drops his hand on revolving work and loses some fingers.

Everyday we read of automobile and

plane crashes.

Tabulate the mishaps and you get the staggering total of 9,000,000 Americans killed or injured by accidents in one year.

Why do they happen?

How can they be prevented?

Ten thousand men and women will try to learn the answer when they assemble from every section of the country at the 28th National Safety Congress in Atlantic City, N. J., for five days beginning Oct.

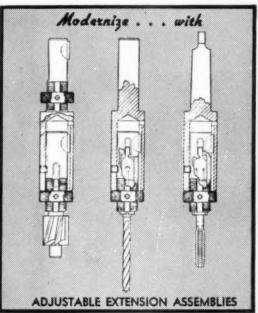
Every phase of national life will be studied by these safety leaders as they seek to overcome the hazards that cripple and kill.

The highways, the homes, the farm, the school—all will be scrutinized minutely. More than 500 speakers and discussion leaders will guide the

hunt for hazards.
The Congress is the annual meeting of the members of the National Safety Council. Fruits of the year's experience and research into the causes of accidents will be offered for

common knowledge and benefits.

Delegates from many factories will hold sessions devoted to the safety problems of their own industries. New types of guards and protective equipment will be studied. They'll learn about new psychological devices for keeping men interested in safety.



SCULLY-JONES adjustable extension assemblies have been designed to permit a quick adjustment of the tool, in multiple spindle work, without disturbing the entire setup . . . to lengthen or shorten assemblies, simply release the set screws in the nut and body, then turn the knurled nut to secure the correct adjustment.

Furnished in standard or special sizes

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DON'T LET MISFIT SOCKET SCREWS WRECK YOUR PRODUCTION SCHEDULES

SPECIFY



SOCKET SCREWS

and be sure of perfect fit every time.

There's no chance of lost production time, through fussing and fiddling around with misfit, poorly machined socket screws, when "Unbrakos" are used. The uniform accuracy of "Unbrako" Socket Screws, that makes every one a perfect fit, is definitely assured by our rigidly controlled methods of machining and inspection.

Furthermore, when you order "Unbrako" you get screws made of properly heat treated alloy steel . . . the result of many years' experimentation and practical service in almost every line of industry.

Next time, be sure .. specify "Unbrako". In the meantime, get a copy of our "Unbrako" Catalog.



Fig. 232 "UNBRAKO" Hollow Set Screw



Fig. 1434 Knurled
"UNBRAKO" Socket
Head Cap Screw.
Pats. Pending.

STANDARD PRESSED STEEL CO. JENKINTOWN, PENNA.

Boston Detroit Indianapolis

Box 559

Chicago St. Louis San Francisco

Rayotube Temperature Detector

By means of a temperature detector which "looks" at heat from a safe location, many plants, it is reported, are now getting continuous data from points never before detectable . . . are getting, at lower cost, more accurate data than they used to get . . . or are getting it more quickly. Called a Rayotube, this detector can sight on work in motion. It is said to be safe from damaging heat, sealed against contaminating gases, and virtually unaffected by vibration. A description of



Rayotube, and pictures showing some of its uses in heat-treat, forge-shop, steel mill, cement and lime plant, and factory, are contained in a profusely-illustrated 6-page folder just issued by the Leeds & Northrup Co. For a copy, address them at 4934 Stenton Ave., Philadelphia, Pa., and ask for Folder N33B (2).

Logansport Export Representative

Logansport Machine, Inc., Logansport, Ind., announce appointment of the well-known firm of Benjamin Whittaker, Inc., 114-118 Liberty St., New York City, as their Export Dept.

Logansport manufactures a complete line of "Standard" air and hydraulic equipment, including arbor presses; chucks; cylinders; clamping devices; drilling fixtures; expanding mandrels; work ejectors; holding devices; milling fixtures; valves; vises; drilling and milling machines; special air and hydraulic equipment presses, line reaming machines, assembly machines and devices.



don't drill small holes

DURABLE Patent Piercing Punches with Intermeshing Sleeves are being used by many of the leading industrial concerns to punch holes of a diameter smaller than the thickness of the material to be pierced. And the savings are worth while.

DURABLE punched holes are straight, without any draft or taper—and the holes can be held to tolerances that eliminate broaching or reaming operations.

Holes may be punched in uneven parts such as malleable castings or forgings—on angles or sloping faces. Stainless steel and other hard alloys are easily punched.

On any punching job, DURABLE Punches last longer because the completely supported punches can be harder—and that means wear resistance. DURABLE Punches are vertically lapped. The smooth, lapped finish makes for easier stripping, and retards firing or galling.

Write TODAY for free Handbook showing construction of many typical dies used by industrial leaders.

DURABLE PUNCH & DIE CO., 711 W. Lake St., Chicago, Ill.







Investigate our NEW VERTICAL PRESS TYPE WELDERS. Its something NEW for precision work. CHAS. EISLER has over 50,000 SPOT WELDERS in daily use, from 1/4 to 500 KVA. We also make standard and special TRANSFORMERS of all kinds.

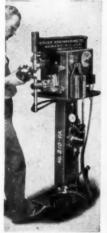
WE INVITE CONTRACT SPOT WELDING IN LARGE OR SMALL QUANTITIES.

Please write to us for more information.

Kindly mention Hitchcock's Machine Tool Blue
Rook.

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EISLER ENGINEERING COMPANY

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Newark, New Jersey



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Built for exceptional SERVICE

Engineered for super performance and long life, you'll find in the New Rockford Presses, very modern advance—Chrome Nickel Crankshaft, Hard Bronze Bushings, Timken Bearing Back Shaft, to mention just a few.

There's a model for every requirement—and all are backed by more than 30-years' experience in press building. May we tell you more—and send a copy of our complete catalog?

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In Any Modern Shop

This sturdy 36"x48" Milwaukee Surface Plate is of semi-steel construction, accurately machined, provided with cross ribs every 10½" for rigidity, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate30". Shipping weight 1100 lbs.

We also make larger and smaller plates either with planed or scraped surfaces which ever is desired.

Write today for full information.

J. C. BUSCH COMPANY

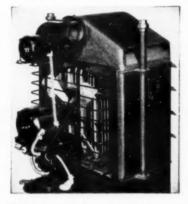
ENGINEERS AND MACHINISTS SINCE 1907

E. Pittsburgh Ave. and So. Ferry St.,

MILWAUKEE, WIS.

"If Winter Comes"

The Automatic Gas-Steam Radiator Co., 448 Brushton Ave., Pittsburgh, Pa., announces a new series of five gas-fired unit heaters, ranging in capacities from 85,000 to 200,000 b. t. u. per hour, which are equipped with automatic flues for venting products of combustion from interior of building. These heaters employ natural or manufactured gas for fuel and are applicable for many types of buildings.



The automatic flue consists of a motor and blower connected so that when the heater starts to work, the flue automatically carries the products of combustion through pipe and wall to the outside.

Operation and construction of these new unit heaters is quite simple. The unit is suspended from the ceiling, out of the way. The gas fires into a combustion chamber and the products of combustion pass upward into a bank of tubes, and then are automatically carried outside. Air is passed around these tubes by means of a motor-driven fan located on the back of the unit.

A safety pilot turns off the gas if the pilot goes cut or burns too low to insure ignition.

The manufacturer will gladly forward complete information, literature and prices upon request.

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Tool, Production and Disc 1/4 H. P. to 20 H. P.



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1 H. P. to 50 H. P.—A model for every application



A MODERN, UP-TO-DATE LINE of Quality Grinders and Polishers.

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The "Butterfly"

Filing and Die Making Machine



Constructed as per specifications of United States Navel Aircraft Factories

Beware of Imitations?

Our machine carries the Butterfly trade mark.

NEW MODELS D. & E.L.

The "Butterfly" owes its ever increasing popularity to its high standard of efficiency. It is the quietest machine of its kind and is well adapted to highly accurate work. It is being used by the leading manufacturers of the United States and Europe and also by the United States Government.

> Write for folder D. and E. L.

HARVEY MANUFACTURING CORP. 161 Grand St., New York, N. Y.

Machining Die Castings

An informative, 24-page book on machining zinc alloy die castings has just been released by the New Jersey Zinc Sales Co., 160 Front St., New York City. Much valuable data based on actual commercial machining procedures is contained in "Practice In Machining Zinc Alloy Die Castings." Every method reviewed is the recommendation of some die caster, some large user of die castings, or some tool manufacturer.

It is the purpose of the book to summarize current machining procedure with zinc alloy die castings. As in the machining of other metals, there is a variation in practice throughout the industry, and often there are two or more ways of doing the same job well. The best methods of machining which have come to the attention of the New Jersev Zinc Co. are presented interestingly with many explanatory diagrams.

The New Britain Universal VISE.



NEW BRITAIN TOOL & MFG. CO. NEW BRITAIN, CONN., U. S. A.

Hamilton **Elevating Tables**



enable one man to handle dies that would otherwise require two or three men to lift.

Send for illustrated circular.

The Hamilton Tool Co. Hamilton, Ohio

BEST VALUES ON THE MARKET

SWIVEL MILLING MACHINE VISES

- Jaws, hardened and ground
- 1º Acme steel screw
- Opens with steel jaws 41/2"
- Body ground finish
- Graduated base
- Flanged construction



85 LB. Master

61/2" SIZE

\$27<u>.00</u>

Suitable for milling machines, drill presses, shapers, etc., these large semi-steel vises may be used plain or swivel. The steel jaws are sturdy. Key slots provide for attachment to machine table holding surface, with jaws at right angle or parallel to table. Junior 4½ size, 45 pounds,

INDEPENDENT LATHE CHUCKS

WHY PAY MORE when you can buy an L-W high grade heavy duty Lathe Chuck that will give you long and satisfactory service.

NEW LOW PRICES

10" Size... \$27.00 12" Size... 31.00 14" Size... 36.00

16" Size... 45.00 18" Size... 58.50



Jaws hardened and ground

• Screws, nickel steel

Bearings, hardened steel
 Ground finish.



SAVE MONEY

ON
Lathe Chucks
Dividing Heads
Magnetic Chucks
Demagnetizers
Milling Machine
Vises

Best Values ever offered!

Power Hack Saws

Send Today for NEW free Catalog

L-W CHUCK CO.
1-7 N. ST. CLAIR ST., TOLEDO, OHIO

2 FIRSTS

- The first small abrasive wheels mounted on steel mandrels to be offered to industry.
- The first with a special new and exclusive Bond-stronger than ordinary bond —grinds more pieces per wheel-gives much longer service—eliminates tedious, costly hand work.

Made to meet modern workings conditions on all type operations.

"CHICAGO" Mounted Wheels

"CHICAGO"
Mounted Wheels
are tough,
with a bond
that "can
take it".

Prompt shipment from stock at all times. A full range of grades, grains and abrasives in all shapes insures the right Mounted Wheel for the job.

Catalog illustrating the complete line sent FREE

HVNDEE

The <u>first</u> tool of its type and the leader today. The biggest handful of smooth, controlled power with a reputation for unexcelled efficiency in over 300 different kinds of industry.

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In reality, the Handee is a small "power house" that can be carried to any part of the plant—to repair some hard-to-get-at part on a machine without removing the part—to smooth off rough edges on dies or moulds or to bore tiny holes in metals in the model and tool room—to clean delicate mechanisms in laboratory—for special jobs on the regular production line, etc.

Streamlined and balanced to fit the hand perfectly. Weighs only 12 oz. Special air-cooled, custom-built motor develops 25,000 r. p. m.—plenty of speed for any job. Because of its outstanding and exclusive features, there are MORE HANDEES IN USE TODAY THAN ALL OTHER TOOLS OF THIS TYPE COMBINED.

For heavy duty work, investigate the Hi-Power Handee at \$35.00.

TRY A HANDEE!

You'll be amazed at the seemingly impossible jobs it performs - at its pencilpoint precision-at the time and money it saves! Try it for 10 days in your own plant, under your own working conditions. If not entirely satisfied, return it for full credit.

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50% on your replacement and repair costs.

MSIMILE RESPONSIB

A tool that you consider scrap is in the right condition for us to demonstrate our process. Send for catalogs.

Call and see us at our Booth A-6 in the Central Armory across from the Auditorium, Cleveland, O., October 4-13.

TOOL CO., INC., MASTER CLEVELAND OHIO EASTERN CUTTER SALVAGE CORP., NEWARK, NEW JERSEY THE MASTER CHROME SERVICE. INC CLEVELAND, OHIO

HITCHCOCK'S MACHINE TOOL BLUE BOOK

Colonial Expands 'Junior' Press Line

Colonial Broach Co., Detroit, has expanded the Junior line of presses to include five basic models in four capacity ranges and three strokes.

The line now includes a ¼ ton press with 9 inch stroke, the previously announced ½ ton model with 12 in. stroke; a one ton model with 12 inch stroke, and another of similar capacity but with an 18 inch stroke. A two ton hydraulic press with 18 inch stroke completes the line.

All models are similar in general design and construction, differing mainly in dimensions. The completely self-contained operating system in all models includes constant delivery pumps of 1000 lb. pressure capacity submerged in an oil reservoir in the base of the press column. The pumps are direct-driven through flexible couplings from standard electric motors vertically mounted

Sanding and Polishing
Machines

Portable Electric Diac and Oscillating Types.
Send for circular THE NEDCO CO.
87 Rumford Ave., Waltham, Mass.

within frame of the column.

Ram control is through a four-way valve, operated either manually by the single-lever control, or automatically by the ram travel itself through use of the adjustable stops provided.

Provision is made for the installation of a pressure gage on the column, for use in assembly work where press-fit tolerances are important. Thus equipped, the reading of the pressure



Drop Forged Steel

Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 185,000 stock sizes and 46 different styles. A die service that is unsurpassed. Let us prove it!

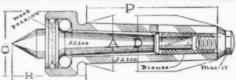
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E. A. BAUMBACH MFG. CO.

1810 So. Kilbourne Ave.. Cl

CHICAGO, ILL.

RIGID RESILIENT BULL CENTER



Rigid Tool Holder Co., 2,000 Witherell St., Detroit, Michigan

A disappointed buyer is slow in paying for his disappointment; while we have never yet, lost a dollar, on a purchase order; or a customer that we know of; and seldom send out a "Please remit". But we are real cranky, about good work, and good material. The best is none too good. Excellence in Designing and Manufacturing is Excellence in Advertising.

All Morse tapers carried in stock.

EASTERN CUTTER SALVAGE CORP., NEWARK NEW JERSEY THE MASTER CHROME SERVICE, INC., CLEVELAND, OHIO

Page 94

HITCHCOCK'S MACHINE TOOL BLUE BOOK



West Newton, Mass.



LEMPCO

All Purpose Presses

Up to 60 tons Pressure

> **Built** to ake it"

Install a Lempco Press in your shop today for pressing on arbors, setting dies or any one of the many jobs that call for a power or hydraulic press. There are different models, all of heavy I-beam and channel construction, priced to fit any shop. Write for catalogs giving all the details.

LEMPCO PRODUCTS, INC.

Dept. 1HP

BEDFORD, OHIO

No. 0 Motor Driven Hand Feed Surface Grinder

For Small Precision Work 5x12* Table 6x1/2" Wheel 1/2 HP Motor

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Gallmeyer & Livingston Co. 405 Straight Ave., S. W.

Grand Rapids Michigan



Are we using Cutting Off Tools

J. Milton Luers 8790 Grinnell Avenue

Michigan Detroit

gage during assembly will indicate the character of the fit, thereby serving as an inspection device.



The hydraulic system also includes an adjustable pressure relief valve so that maximum ram pressure may be adjusted to any desired amount within the capacity of the machine. Thus maximum ram pressures may be limited, if desired, to prevent damage of parts during assembly due to too tight a fit, etc.

\$25 BUYS A POSTEL (Minneapolis) DIE FILER



A dependable, precision tool that will soon pay for itself.

Write for full information

The Postel Filing Mch. Co. 915 Washington Ave., So. Minneapolis, Minn. The presses may be used for miscellaneous broaching work in addition to assembly operation. While designed primarily for work on relatively small parts, the exceptional amount of throat clearance (between ram and column) permits performing of similar operations on quite large and bulky parts.

The presses are available for operation with either automatic return of the ram after the power stroke, or with the ram stopping at the bottom as well as the top of its travel. The ram operating cylinder is integral with the massive one-piece column of the machine for maximum rigidity. Ram speed, down, is 30 ft. per minute, with high speed return of 60 ft. per minute in all models.

Niagara Bulletin No. 74-A

Bulletin No. 74-A of the Niagara Machine and Tool Works, Buffalo, N. Y. pictorially and diagramatically describes Niagara manually and power operated folders and brakes.



Writes on hardened steel — demagnetizes at the same time-with carbon point does light spot annealing and soldering jobs. Compact easy to use—dependable.

Send for details-5-day FREE TRIAL OFFER!

Luma Electric Equipment Co. Dept. H-Main P. O. Box 132, Toledo, Ohio

Hobart "Transarc" Welder

Hobart Brothers, announce a new AC Arc Welder with a range of 20 to 200 amperes for use on "220" single phase power lines.

The makers claim the new improved features incorporated in the "Transarc" greatly broaden the application of welding in many fields, such as garages, repair shops, sheet metal shops, bus and truck fleet repair shops, plumbing and piping works, welding shops,

blacksmiths, machine shops, manufacturers, maintenance and general repair as well as a wide variety of metal fabricating shops.



Outstanding features emphasized include safe operation no electrical or mechanical connections between power lines and welding leads. Efficiency claimed is high—95% measured by KW input. Stable arc—because of special inbuilt construction the striking or arc holding voltage increases as welding rate is reduced making the arc very easy to hold under all conditions. Operating cost—current is consumed



will fit. Vimcolights are the choice of leading manufacturers of metal-working machinery. Write today.

No matter what machines you have Vimco

VIMCO MFG. COMPANY, Inc.



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A watch for every purpose

Let us send FREE 12 page folder No. 9H fully illustrating and describing some 40 types of stopwatches and accessories. No salesmen will call.

REPAIR | for all kinds of plain and complicated stopwatches.

SERVICE | Send to us for estimates; no charge, no obligation.

A. R. & J. E. MEYLAN, 266-68 West 40th St., New York City, N.Y.

"Specialists in timing instruments"

only when actual welding is being done. Special steel core keeps no load losses at absolute minimum which also increases full load efficiency. designed-welding current adjusted in large number of steps. Current desired for any job is available instantly making welding easy on both light and heavy work. General specifications include:- mounting, hard rubber, ball bearing casters. Hand grips on each side for lifting. Controls-large ring welding range control. Inner switch used to adjust to any special arc condition or as intermediate steps between outer ranges. Combination of two provides 30 steps of adjustment. Inner control can be used to disconnect welder from power line without pulling power plug or shutting off regular line switch. Size and weight-32" high x 18" wide x 14½" deep. Weight approximately 210 pounds. Equipment comes complete with electrode and ground cables, electrode holder and ground plate, head shield, wire brush, assortment of Hobart Electrodes, and power cable and plug.

An attractive two-color circular is available describing this unit in complete detail and will be furnished to anyone interested by writing direct to the Hobart Brothers Co., Box TA--69, Troy, Ohio.

Niagara Press Broadside

The entire line of Niagara Master Series"A" Inclinable Presses is pictorially reviewed in this new bulletin. Cutouts of the presses in the graduated range of sizes attract the reader's attention, at the same time illustrating comparative sizes, proportions and capacities at a glance.

Outstanding features of these presses are strong rigid frames, 14-point sleeve clutch with built-in single stroke mechanism, multiple V gibs, breech block die clamp, and inclinable device equipped with anti-friction bearings.

Also reviewed pictorially are the Niagara Air Clutch of disc type having

Protect Shop Orders, Drawings, Blueprints...



W A D E Shop Envelopes

Any size or style to order, stiff or flexible, to suit your requirements.

Send for folder and quotation.

WADE INSTRUMENT CO. 1663-H E. 118th St., Cleveland, O.



HANDY RACKS SAVE TIME and MONEY

Tremendous capacity between the knees and shoulders of a man's height and in small floor space. No stooping, stretching or back-breaking. Very valuable in connection with supplying stock to automatic screw or parts-machine:

30 days approval if you wish.

Write today for details.

Wm. S. Yohe Supply Co. 503 Mahoning Rd. N. E., Canton, O.

the pressure applied on the discs directly from the air cylinder, which is built integral with the clutch and brake; the patented Niagara 14-point engagement with built-in single stroke mechanism; Series BL Shears with built-in capacities up to 10 gage.

For your copy of this attractive, wellillustrated broadside write to the Ningara Machine & Tool Wks., 637 Northland Ave., Buffalo, N. Y

High Pressure Starting-Air Compressor

Type 20 vertical, stationary, twostage, high pressure air compressors for starting internal-combustion engines are the subject of an illustrated description leaflet by Ingersoll-Rand.

These machines are built in four sizes ranging from 1½ to 20 horse-power for piston displacements of from 29 to 60 cubic feet per minute at discharge pressures of 300 to 400 lb, on heavy-duty service, and up to 1000 lb on intermittent starting service. They are available in a variety of drives which include direct connection to electric motor, gasoline or oil engine, and flat or V belt.

The Type 20 compressor is water cooled, automatically lubricated, and requires a minimum of attention. It is particularly adaptable for use in starting stationary and marine Diesel engines, as well as for supplying small quantities of high pressure air for industrial applications.

Copies of the description-sheet, Form 2437, are available from the Ingersoll-



Rand Company, 11 Broadway, New York City, or any of their branch offices.

Handling and Storage

Sectionalized work carriers of standardized dimensions and construction, yet so flexible in combination that they may be used for interchangeable storage and handling of almost any conceivable type of product, during



ETCHERS and DEMAGNETIZERS

Let us tell you the many advantages of our new D. C. and A. C. models now available. Also, see our new line of Magnetic Parallels and Midget Chucks.

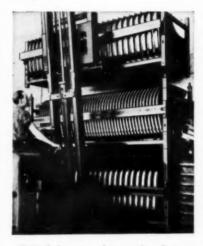
Send TODAY for latest circulars

PRINTZ ELECTRIC CO.

14595 KENTUCKY AVE.,
DETROIT, MICHIGAN



process, assembly, inter-department or even inter - factory transit are announced by Mechanical Handling Systems, Inc., 4700 Nancy Ave., Detroit, Mich.



Priced low as the result of mass production the carriers are of arc welded square steel tubing for light weight, yet sufficiently strong to handle loads up to 3,000 lbs. The basic unit consists of a 3'3" x 9 foot frame with an end frame 2'8". The other end of the base has a short upright at each corner, each post being open at the ends so that a removable end frame, similar to the permanent one, can be slipped in to form a symmetrical



WM. CARROLL & SON 1776 Lezington Ave., (Norwood) Cincinnati, Ohio carrier. With both ends of each end post being open, it is a simple matter to insert an end frame of any required height against which may be stacked unusually long parts. Removable casters can be slipped in to create a mobile unit which can be pushed around the shop by hand or hauled in "trains" by a factory truck.

The standard unit is provided with two 2 x 6 inch planks (lengthwise) on which inexpensive dunnage can be quickly installed and, when necessary, quickly changed to suit other parts. Side rails for bracing large parts carried on edge or hold-down rails between the two end frames are easily attached. Floors and sides of either solid wood or metal, or perforated metal, where required, provide a bin for small parts.

A catalog suggesting various inexpensive methods of adapting the work carriers to many different types of parts, sub-assemblies, odd shapes, etc., and giving complete information on various accessories is available on re-

quest.

LET US QUOTE...



Our new modern plant is fully equipped with special machinery for

COMMERCIAL JIG BORING, DESIGNING AND BUILDING of

DIES, JIGS AND FIXTURES LARGE OR SMALL

We can handle your Jig Boring jobs at reasonable prices on our new 18°x36° Pratt & Whitney Jig Borer. Quick service.

Have been delivering satisfaction since 1929—let us serve you.

QUALITY TOOL & DIE CO.

Ray W. Rice, Manager,

401 N. Noble St.,

Indianapolis, Ind.



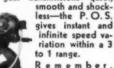
LATE AS THE 1820'S THERE WERE STILL SHOP PROPRIETORS WHO CONSIDERED THAT THE BEST "PRIME MOVER" TO OPERATE GRINDSTONES EMERY WHEELS AND HERW-DUTY METALTURNING LATHES WAS A MAN TURNING A LARGE WHEELGENRED TO THE MACHINERY BY THIN RAWHIDE OR GUT BELTING

BUT THIS IS 1939...

and it has been a long step forward to the efficient, dependable, modern BERKELEY Drives for all machine tools.

The latest P.O.S. (Positive Optional Speed) Berkeley Drive meets the exacting requirements of today's production schedules—

with just the right speed for the job. More flexible than gear transmissions—quiet,



Remember, Berkeley can supply motorizing equipment for all machines and all purposes.

Send for Bulletins.

BERKELEY ENGINEERING CO., 1381 E. 17th St., Clevelson, O.

Knu-Vise Develops New Model

A new design of the popular Knu-Vise clamps is being used in various ways in connection with the production of 1940 model cars. The application shown is in connection with roof panels and gutter mouldings.



An attractive feature of this new model is that it clamps upwards as well as downwards, holding the work against the lower part of the toggle bar.

Full details on this and many other applications may be obtained by addressing Knu-Vise Inc., 6436 Cass Ave., Detroit.

Bergram Offers New Units

A new bench type Surface Grinder, designated as model S-1 is offered by Bergram Mechanical Engineering Co., 18 Hartford Ave., New Britain, Conn.

Of sturdy construction throughout, it features a precision spindle and sensitive table travel. A permanent magnetic chuck is incorporated with a 5" x 10" grinding surface. Interchangeable pulleys compensate for wheel wear.

For groove grinding an adaptor is furnished for mounting small wheels.

The other unit is a radius dresser for shaping wheels used in contour grinding. This is built for mounting in the work head spindle of the Bergram Utility Grinders, or in a bracket on the table or any grinder.

T. H. L. FRONT LEVER

Built for hard, tough work — die can-PRICE WITH ONE not lose align-

PRICE WITH ONE PUNCH AND ONE DIE—
\$37.00

not lose alignment with punch — all parts interchangeable.

Capacity—
1/2" holes through
3/16" steel; 13/32"
through 1/4" steel.
Can also be made for holes up to 7/8" in thinner metal. Stock punches and dies available from 1/16 to 1/2" by 64ths. Weight, 70 lbs.

T. H. Lewthwaite Machine Co. (Est. 1890) 311E 47th St.,



For Every Coolant Need . . .

There's a GUSHER Coolant Pump of the proper type and the right size for every coolant need—and GUSHER Pumps stand up in the hardest kind of service.

They're self-priming—
have fewer wearing
parts—neverrequire repacking—no metal-tometal contacts—bearings are protected from
abrasive matter.



The Ruthman Machinery Co.,

on.

538 E. FRONT ST., CINCINNATI, O.

ANDERSON Improved Balancing Ways



Every shop handling rotating parts needs this simple, sturdy, dependable device for balancing, straightening and truing operations. Saves time and trouble and assures better work.

Four chilled iron discs rotate with minimum friction on sensitive special bearings, giving a prompt, sure indication of whether or not the work is in perfect balance.

Write NOW for full information.

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

ANDERSON BROS. MFG. CO., ROCKFORD, III. 1907 Kishwaukee St.



Used on 1940 model auto drill fixture

KNU-SINE TOGGLE CLAMPS

These toggle action clamps provide the fastest and yet most inexpensive method of locating parts in dies, jigs, and fixtures. Automatically lock into position, instantaneous release, hundreds of possible applications.

Die in obenstehendem Bilde gezeigten Kniehebelsätze sind für sehr vielseitige Verwendungszwecke bestimmt, wie z.B. für das Festhalten von Blechteilen während der Ausführung von Schweissarbeiten, ferner für das Einspannen von Fertigungsstücken während des Bohrens, Gewindeschneidens und ähnlicher Arbeitsgänge.

Ask for catalog and new reduced prices.

MFD. BY

KNU-VISE INC.

DETROIT, MICH., U. S. A.

SALES AGENTS THROUGHOUT THE WORLD

The dresser has a range of 1" diameter, either convex or concave. Radius setting is accurately made by direct micrometer reading over diamond point and fixed anvil, and adjustment is made through graduated fine screw, locked by clamp screw.



For angular or straight dressing, the swiveling head is rotated to correct position, and the diamond advanced across the wheel by turning the adjusting screw.

Dreis and Krump Catalog

A thirty-two page catalog, said to be the most complete ever issued on hand bending brakes, has just been released by Dreis & Krump, 7440 Loomis Blvd., Chicago. The booklet is profusely illustrated containing over 75 pictures, diagrams, and charts covering the complete "Chicago" line of steel hand bending brakes.

Throughout the catalog, simplicity of operation and design is stressed. Illustrations of the one-man operation of all the hand brakes are featured, as well as the replaceable and polished bending edges.

"Patent War"

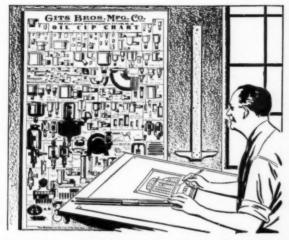
"The battle over the right to invent and develop new machines was the basic cause of the American Revolution. It was not a political revolution, as commonsupposed: was a struggle of economic character for the new Colonies' right to their place in the sun to make and sell their own developments.

"England feared the colonies would develop manufacestablishturing ments in competiwith her tion industries. home Her purpose was to maintain the Colonies as a source of supply for raw materials and semi-fabricated materials to supply the manufacturing industries of England.

"Large sum s were appropriated by British Parliament and by manufacturers' associations in England to promote this

purpose and to prevent the Colonies from acquiring from England any inventions, improved machine tools, or any other new ideas which might facilitate the manufacturing in the New World.

"The first step taken by the government of the United States was to promote and protect American manufacturing by establishing a system of patent law. Thomas Jefferson was the first commissioner of patents. It is



Your Engineering Department needs this Chart Now!

After completing your designing, and your particular application calls for oilers, then is the time to refer to GITS OILER CHART. At a glance you may find just the right oiler to suit that particular application, or you may send in your drawings and our engineers will gladly help solve your problems. GITS has an oiler for all applications. Backed by 30 years experience manufacturing oilcups exclusively.

A full size 24x36 chart will be mailed to your engineering department upon request.

GITS BROS. MFG. CO.

28 years of oil cup experience

1860 South Kilbourn Ave. Chicago, Ill.

largely due to his democratic purpose the patent laws we have today are in the shape we have them. He was determined that no matter how impoverished an inventor might be, he would have a reasonable opportunity of protecting his invention and thereby contributing to the national welfare, as well as to his own prosperity."

This, as well as many other aspects of the United States Patent Law, procedures, and history appear in the book "Patents and the Public Interest" by H. A. Toulmin, Jr.

Solenoid Multiple Rivet Setter

What is believed to be the first multiple setter to employ a movable anvil which is actuated by a solenoid, has recently been developed by the Chicago Rivet & Machine Co., Chicago. Its design permits the employment of a special indexing fixture whereby the application of multiple setting to the line assembly of small parts becomes more practicable. Pressure of the operating pedal causes the solenoid to actuate a toggle movement, raising the anvil into clinching position. When clinching is completed, the driver automatically raises and disconnects electrical contact with the solenoid. This causes anvil to drop, permitting moving of assembly fixture to next indexing position. The unit is adapta-



ble for clinching tubular rivets as well as evelets.

HOW TO SELECT AND HEAT TREAT TOOL STEEL To Get Better Tools

If you are responsible for tools—if you want a plain, practical, common sense explanation of how to make tools last longer—if you want a simplified method of selecting and heat treating

tool steel—if you want 315 pages of answers to everyday tool room problems—here is the book you want.

Over 12,000 copies in use

TOOL STEEL SIMPLIFIED

By Frank R. Palmer
Assistant to the President
The Carpenter Steel Company
315 pages—6x9—205 illustrations
\$1.00 postpaid in U. S. A.
\$3.50 outside U. S. A.

With its help more than 12,000 tool makers are showing their companies how to get bigger production and how to reduce costs. You will gain from it information formerly available only from steel mill experts—information in simple non-metallurgical terms that will help you gain more complete control over the progress of your work. Usethis convenient coupon to get your copy of this handbook.

Quick Answers To Questions Like These
How to atop tools from warping
How to avoid grinding checks
How to make tools wear longer
How to make tools that won't
break

How to prevent size change
How to make the spark test
How to be a trouble shooter



51 Postpaid

How to be a trouble shooter	in U. S. A.
THE CARPENTER STEEL CO Dept. B-12, Reading, Penna. I WANT TO REDUCE TOOL me postpaid your convenient, "TOOL STEEL SIMPLIFIED," (\$3,50 outside U. S. A.) in full po	COSTS. Please send 315 page handbook— 1 am enclosing \$1.00
Name	
Address	
City & State	************
Firm	*************************
Occupation	

Ohio Gear and Reducer Reference Guide

A handy reference guide of gears and reducers has just been published by the Ohio Gear Company, 1333 East 179th St., Cleveland, Ohio. This latest catalog of 136 pages is conveniently indexed for quick reference.

A high gloss, durable binding protects the digest-size volume. Complete

description and specifications of the Ohio line of chains and sprockets, broaches, V-belts, pulleys, couplings, spiral gears, worm gears, bevel miter gears, spur gears, motorized reducers, two and four speed helical reducers, double reducers, and single reducers.

The handy pocket size guide will find a welcome from all men in machine tool shops or any other industrial organization using gears or speed reducers.









STANDARDIZED JIG BUSHINGS

Prompt delivery from stock on over 10,900 standard items—over 6700 ACME Standard—over 4200 A. S. A. Standard—all completely finished ready for use. Special sizes made to order.

Made in our new plant by the most exacting and scientific methods—insuring accurate fit plus long wear—concentric within .0003" full indicator reading.

Send for bulletin containing complete data and low prices. Satisfactory service quaranteed. Also manufacturers of complete machine parts, specializing in hardened and ground parts requiring extremely close limits, lapped fits, etc. also hydraulic appliances for pressures up to 20,000 lb. per square inch.

ACME Industrial Co. 210 N. LAFLIN ST., - CHICAGO, ILL.

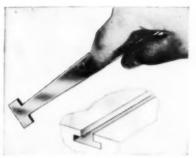
Cleaning Table Slots

A planer slot cleaner, for removing the metal chips from the table slots of milling machines, planers and other machine tools, is now being offered for free distribution by the Dayton Rogers Mfg. Co., 2830 S. 13th Avenue, Minneapolis, Minn.





ILLINOIS Testing Laboratories, Inc. 150 W. Austin, Chicago



This handy tool is die-cut from hard cold rolled strip steel, fully plated to prevent rusting. It is one of those simple, handy machine shop tools—often needed but never purchased or made up. The handle is provided with a hole for hanging in the tool crib, or, may be chained to the average machine tool—ready for use.

At Last!

A Positive, Roll Grip Keyless Drill Chuck . . .

Check these advantages:

- 1-Drills will not slip. 2-100% keyless.
- 3-The heavier the load, the tighter it grips. 4-Ends damaged drill
- shanks.
 5-Yes! The tapered shanks are tempered.
- 6-Slight twist of the wrist releases drill.
- 7—Scientifically designed, ruggedly constructed.
- 8-Runs true—and remains so.
 9-Unconditional oneyear guarantee (barring abuse)
- Send for detailed folder.

Motor Tool Mfg. Co.



Detroit, Mich.

Troyke Offers New Rotary Tables

Additional models of larger, heavy duty rotary tables for horizontal boring mills, large milling machines, slotters, etc., are offered by Alfred A. Troyke, 221 E. Second St., Cincinnati, O. These are in the 25" size shown, also 21" and 18" models.



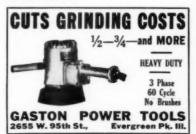
These tables are so constructed that dividing attachment with dividing head plates may be supplied after tables are in use.

The new models are in addition to the smaller line heretofore offered, comprising 9", 12", 15", and 18" models.

These modern rotary tables embody many advantageous features that are described fully in a bulletin which will be sent on request.

Convenient Bronze Bar Stock List

An unusual stock list that can be conveniently hung on the wall and used as a ready reference has just been issued by the Johnson Bronze Co., 310 South Mill St., New Castle, Pa. Printed on very heavy stock in the actual shape of a large size bar of Johnson Universal bronze, it contains full specifications of the 329 sizes of cored bars carried in stock.





SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table

swivels and locks in any position. Can be varied 151/2" by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

Send TODAY for illustrated catalog No. 2.

MIDWEST TOOL & ENG. CO.
112 Webster St., Dayton, Ohio



FAST!

SAFE, ACCURATE AND AUTOMATIC—



You can speed-up operations with greater safety and accuracy with WITTEK AUTO-MATIC ROLL FEEDS. Keep presses operating up to capacity—feeding any stock from coils in lengths up to 24* per press stroke—saving in time and dies and cutting production costs. Single Roll, Double Roll and Compound Types with Straightener — for every size and make of punch press without alterations.



WITTEK Reel Stands

— 6 models — enable
one man to center
heavy coils. Ball bearing mounted—adjustable to any height—
balanced at any angle
—500-lbs. capacity.

Send for Bulletin "HF" giving complete details.

A size for every requirement.

WITTEK MANUFACTURING CO. 4305-9 W. 24th Place. Chicago, III.

Stanley "Ace" Strapping Tool

The Stanley Works, New Britain, Conn., announces a new strapping Tool designed to strap shipping containers quickly and securely. With this new tool it is said strapping is reduced to a five second job.

The tool is equipped with an automatic seal feed. Positive spring feed holds the seals in any position. The magazine is loaded with a clip of 100 seals, available in 3 sizes, for \(^{1}\sqrt{4}''\) \(^{3}\sqrt{8}''\), and \(^{1}\sqrt{2}''\) strapping.



Operation of the "Ace" is simple. The strapping is fed into the tool; a few quick pulls of a tension lever tightens the strapping. With the strapping tensioned, a second lever is pushed forward cutting the strapping and automatically sealing it. The complete operation requires but two motions.

An attractive new four page bulletin gives completes information with illustrations of typical jobs.

Knu-Vise File Folder

A compact file, fully illustrated, containing prices and descriptions of the complete Knu-Vise line of holding fixtures, toggle clamps, toggle pliers, plier parallels and layout tables has been prepared. This handy reference folder fits conveniently in filing cabinets and may be obtained by writing Knu-Vise, Inc., 6436 Cass Ave., Detroit, Mich.

Milliken Ball Turret Heads

A ball turret head, holding six tools and fitting any engine or speed lathe tail stock is offered by the Milliken Machine Co., West Newton, Mass. By this means the lathe is quickly and economically converted into a six tool turret lathe. The turret head can be put in position or removed as quickly as an ordinary center. It can also be used on large turret machines, singly or in multiples.



Two sizes are offered:—No. 1, $3\frac{1}{2}$ " diameter with sockets $\frac{6}{3}$ " x 1" deep and No. 2 with a diameter of $5\frac{1}{4}$ " and sockets $\frac{7}{6}$ " x $1\frac{1}{2}$ ".

Also included in the Milliken line are:—a spring vise jaw clamp, an 11" lathe slide rest, inside and outside angle plates and bench plates.

Peters Vertical Oscillatory Grinder

A simple and compact vertical grinder, designed for fast precision work, with a short oscillatory movement that eliminates lines in ground parts, is offered by Peters Tool Co., Inc., 114 East Scott St., Milwaukee, Wis.

It is especially useful for grinding straight, smooth, square surfaces and is adjustable to any angle. It can be used on form tools including Tungsten Carbide.

Movement of a single lever permits stopping of the oscillatory movement for using form wheels or dressing the wheel with a diamond.



If You Clamp Parts in Fixtures!! — —

for such momentary operations as machining, welding or assembling; then you will be interested in knowing more about the nationally accepted, efficient De-Sta-Co Toggle Clamps.

Used by Chrysler, Dodge, General Motors, Packard, Douglas Aircraft, Western Electric and hundreds of small shops.

Send now for De-Sta-Co Toggle Clamps new Bulletin No. 39, so as to have it before you when designing that next fixture.

DETROIT STAMPING CO.

Established in 1915

3400 West Fort Street Detroit, Michigan





See it at the Warner & Swasey booth, Machinery Tool Show, Cleve., Oct. 4 to 13

With this universal tool you can grind cutters, reamers, taps, end mills, metal slitting saws, carboloy bits, etc. quickly and accurataly. Send for bulletin AC39H.

K. O. LEE & SON CO.
Aberdeen, So. Dak.

"practical tools for practical men"

All bearings and wearing surfaces are entirely enclosed. The taper take-up bearings have large oil chambers. The



oscillating mechanism runs in oil. The compact dimensions of the base permit placing these grinders anywhere in the shop. Base measures 24" x 34".

Power is transmitted from the 1½ h.p., Allis-Chalmers ball bearing A. C. motor by a double Texrope drive. Standard grinding wheels are used and the wheel speed is 5000 r.p.m. Weight of the unit is approximately 925 pounds.

5000 SHAPES AND SIZES SHAPES AND SIZES GROBET SWISS

Write for Catalog WF.

The most complete catalog of its kind.
Lists 5000 different shapes, sixes and cuts
of GROBET precision files.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

GROBET FILE CORP. OF AMERICA 3 Park Pl., New York, N. Y.

"Murco" Unit Heater

A new streamlined model "Murco" Unit Heater is manufactured by D. J. Murray Mfg. Co., Wausau, Wis., in 16 sizes to meet various conditions requiring space heating, either with steam



or hot water. The case is crackle finish, trimmed with chromium strips in front. It is a sturdy unit with the heating elements of heavy wall copper tubes and fins of the latest design. The condenser is "full floating" to overcome contraction and expansion. Equipped with a unit heater duty totally enclosed motor, the general design is such that it harmonizes with any surroundings.

Grinding Kennametal Tools

A new wall chart containing instructions for the correct grinding of Kennametal steel cutting carbide tools, has just been issued by the McKenna Metals Co., 135 Lloyd Ave., Latrobe, Pa. Included in the new chart are directions for grinding tools to produce (1) crescent shaped chips, easily shoveled up, and (2) a coiled chip of tough steel. Also described are two methods of detecting heat cracks caused by improper grinding.

The new chart is printed on tough cardboard stock, varnished on both sides, and punched at the top so that it can be easily hung from a nail on the wall or bench. Sent free upon re-

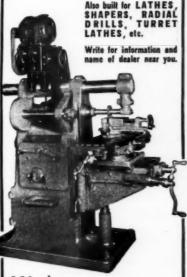
quest.

NOW a Turner UNI-DRIVE

FOR —

MILLING MACHINES

The Turner Uni-Drive has NO overhang or side projection. Compact, quiet and efficient individual drive. Four-speed silent sliding gear transmission. Ball bearing gears run in oil. Sizes ½ H. P. to 10 H. P. Fully guaranteed. Can be installed (without drilling) in one hour.



Mfg. by

The Turner Uni-Drive Co. 1638 Central St., Kansas City, Mo.

The "Skraptrap"

The Breuer Electric Mfg. Co., 5108 N. Ravenswood Ave., Chicago, has developed an attachment called the "Skraptrap" for use on the Tornado Portable Electric Blower when it is being used for vacuum cleaning.

The "Skraptrap" collects the small objects that are unvoidably drawn into the nozzle, thus preventing bolts, nuts,

screws, nails, etc., from reaching and injuring the suction fan blades, while the dust, dirt and lint are readily bypassed into the dust bag.



The "Skraptrap" may thus be used to collect and salvage small parts or metal particles that would otherwise be irrecoverable. Valuable waste material may thus be reclaimed from accumulations about benches or machines or during any routine operation of the vacuum cleaner.



HARD USAGE Doesn't Faze The HARTFORD MILLING VISE



We also Build Machinery on a Contract Basis, Design and Develop Specia | Automotic Maokinery.—Gears and Came Cut to Order. Because it was designed to "take it"—and it does! It will stand up, day after day, under the heaviest, toughest strain of production milling work. Made of the best materials, with all parts interchangeable, it will outlast four of five ordinary view. Rapid and accurate in operation—the top eccentric handle gives instantaneous quick-opening and return. A trial in your shop will coavince you better than anything we might say.

Write for Folder and Complete Details

Jaw width 5' Maximum epening 3½'
Jaw depth 1½' Weight 40 lbs.

Also made in the swivel-jaw type with hard

or soft jaws, maximum opening 2¼'.

HARTFORD SPECIAL MCHY. CO. 285 HOMESTEAD AVE, HARTFORD. CONN. Presenting a new bench type Surface Grinder:

The S-1 Surface Grinder —another BERGRAM Precision Grinder

- Precision Spindle Sturdy Construction.
- 2. Sensitive table travel.
- Permanent magnetic chuck with grinding surface 5"x10"—no wires or generators.
- Interchangeable pulleys to compensate for wheel wear.
- For groove grinding an adaptor is furnished for mounting small wheels.



Bergram Mechanical Engineering Co., Inc.
"Specialists in Grinding Machinery"

18 HARTFORD AVE.,

NEW BRITAIN, CONN.

MARSCHKE Heavy Duty



A catalog showing seventy different grinder and buffer specifications will be sent promptly upon receipt of request.

Grinders and Buffers

Considering only such major specifications as weight and sizes of motor, wheels, bearings, spindle diameters, you'll find a lot of other machines to compare with MARSCHKE ELECTRIC GRINDERS and BUFFERS.

But do not overlook the less spectacular and more important items of material specifications, workmanship and particularly the provisions for lubrication, bearing and motor protection, and above all the details of wheel guard construction.

Let us tell you about the details accounting for the superiority of MARSCHKE GRINDERS and BUFFERS.

Vonnegut Moulder Corp. 1805 Madison Ave., Indianapolis, Ind.



IS AT YOUR SERVICE

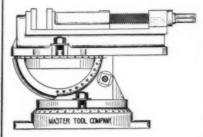
There's no hold up on your Universal orders. In our stock room we have the world's largest and most complete stock of A.S.A. standard drill bushings. Universal bushings with their superfinished bores—straight and round within .0001—are more accurate and wear longer.

UNIVERSAL Engineering Company

Frankenmuth, Mich.

Multi-Swivel Vise

A fully universal vise, complete with three swivels, is offered by the Master Tool Co., 137 Oliver St., Boston, Mass. This vise may be used on drills, milling machines, shapers, planers, and surface grinders. It can be transferred from one machine to the other without resetting the work.



According to the manufacturer, with the Multi-Swivel vise on any plain milling machine, you will be able to do vertical and angle milling that formerly required the use of a vertical milling machine. This unit may be used as a jig for special, straight and angle drilling and milling production work.

The vise can be used in part or fully assembled; all parts are interchangeable. The addition of the platen greatly increases the capacity of the unit. Further information may be obtained from the manufacturer.

Johnson Clutch Catalog

A new catalog, descriptive of Johnson Friction Clutches is offered by The Carlyle Johnson Machine Co., Manchester, Conn.

The standard type of friction clutch with metal to metal frictions, as well as the Super-Johnson type with Raybestos faced expansion ring, the latter to run dry where such a method of driving is required, are both listed in this new issue. All recent improvements are also listed as well as several changes in price.

Cleaning Metal Parts

Those interested in the washing, rinsing, drying and burnishing of metal parts, will want a copy of the new Catalog just published by N. Ransohoff, Inc., 228 West 71st St., Cincinnati, Ohio. Many illustrations of the application of custom built equipment are shown, as well as standard installations in well known plants of automotive, electrical, radio and other metal working industries.

New Britain Catalog

The complete line of New Britain Tools is attractively presented in a new catalog, digest size, recently published by the New Britain Tool & Mfg. Co., New Britain, Conn. This seventy-page, durably bound manual provides a permanent reference for milling cutters, reamers, counterbores, arbors, knurling tools, special tools, and New Britain universal dividing heads and vises.

MARKED - IDENTIFIED



MODEL 25

Send for complete catalog of our full line of marking Tools, Machinery and Equipment.

Permanently

PART NUMBERS, HEAT NUMBERS. CATALOG NUMBERS, SERIAL NUMBERS,

PATENT NUMBERS

MANUFACTURER-INSTRUCTION DATA-INSPECTION

Positive, Permanent MARKING ON YOUR PRODUCTS ASSIST PROSPECTS TO ORDER. MAKES IT EASIER TO BUY-NEW, REPEATS AND REPAIRS. GIVES YOU A DEFINITE RECORD OF PERTINENT DATA ON EACH PART PRODUCED.

The Pneumatic Marking Machine ILLUSTRATED IS OUR HI-DUTY MODEL 2S GENERAL PURPOSE TOOL FOR SHORT RUNS OR PRODUCTION WORK. IT OPERATES FROM YOUR SHOP AIR LINE AND IS ONE OF NUMEROUS MODELS BUILT TO PRODUCE NEAT. PERMANENT MARKINGS QUICKLY ON METAL FABRICATIONS.

WE WILL BE HAPPY TO MAKE SPECIFIC RECOMMENDATIONS UPON RECEIPT OF SAMPLES OR PRINTS OF PARTS TO BE MARKED, SHOWING APPROXIMATE LETTERING, ITS LOCATION ON THE PART, WITH REQUIRED HOURLY PRODUCTION.

MARKED PARTS ADVERTISE IN THE RIGHT PLACE, AT THE RIGHT TIME.

Unlike John Alden —— "They Speak For Themselves."

GEO. T. SCHMIDT, Inc.

1802 Belle Plaine Ave., Chicago, Ill. Builders of Marking Equipment Since 1895.



NEW FEATURE

Built Into Universal's Efficient Collet Chucks

In addition to ground threads which assure concentricity and a handy wrench grip for ease in handling Universal Collet Chucks are now equipped with an automatic release spring which, as the nut is loosened forces the collet forward, automatically releasing the grip on the tool.

UNIVERSAL

Engineering Company Frankenmuth, Mich.

Van Dorn Develops New Tools

Seven units in the Van Dorn line have been redesigned for less weight, more compactness and greater durability.

Particular attention is called to the new ½" Utility Drill which is a full 3½ inches shorter than the previous model; 3 pounds lighter in weight, and its operating balance is described as "perfect." Its close coupled construction, minimum spindle offset and spade handle set horizontally are welcome advantages in confined space. The spin-



dle and bearing features which won acclaim in the famous "Holgun" are also incorporated in this new drill, including a threaded chuck mounting; deepgroove ball bearing spindle bearing with inner and outer races locked in place; needle roller bearing at back end of spindle; splined mounting of spindle gear for increased strength and reduced noise and wear; and grease-scaled ball armature bearing. The new ½" Utility is, of course, powered with a universal motor which operates on either alternating or direct current.

The other redesigned units are the %" Heavy-Duty, %" Utility, 5/16" Heavy Duty and %" Heavy Duty Electric Drills. In addition there are two newly designed drill stands—the No. 20 and No. 40, all of which are illustrated and described in detail in a new four page bulletin.

Ideal Motor Base

A new, low cost motor base called the "Automatic" is announced which it is claimed automatically maintains correct belt tension. It is especially suited to short center drives.

One base covers all types of drives, horizontal, vertical, or overhead and it is said to operate satisfactorily with any type of load, pulsating, steady or reversing.

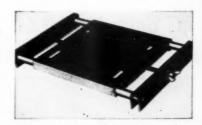
To take up belt slack the adjusting screws are given a few turns. Spring tension holds the motor, takes up slack, and cushions load shock that might otherwise damage motor and bearings.

erwise damage motor and bearings.

Motor is mounted directly on the sliding plate of the base. The complete motor and base is then bolted down as a unit.

Belt changing is easy, since it is only necessary to release the spring tension and place the new belt around the sheaves.

This device is marketed by the Ideal Commutator Dresser Co., 1441 Park Ave., Sycamore, Ill.





OLIVER For Greater Profits in the Tool Room

Provide your TOOL ROOM with an Oliver of Adrian DIE MAKING MACHINE and—

Make better dies for less.

Save 50 to 60% of the labor over hand methods.

Use less skilled mechanics.

Deliver the jobs on schedule.

Models as low as \$125.00.

Nine styles to choose from.

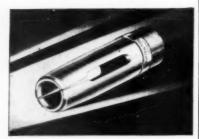
Send for catalog.

"DON'T NEGLECT YOUR TOOL ROOM"

OLIVER INSTRUMENT CO.,

1408 E. Maumee St. Adrian, Mich.

In Both BRONZE



SUTTON Feed Fingers

In Bronze. For screw machine jobs that demand complete elimination of scratching the work specify Sutton standard-design Feed Fingers made of bronze. The bronze is specially selected to provide full-powered spring tension for sure feeding.

And Steel. For general purpose work specify Sutton Feed Fingers of steel. They are expertly heat-treated to insure spring temper with a long and strong come-back.

◆ ◆ Always remember Sutton DIAMOND-GRIP Collets are perfect partners for Sutton Feed Fingers. Their clean-cut Diamond Serrations give a surer grip under less tension.

Ask for Complete Sutton Catalog.

SUTTON TOOL COMPANY 2842 W. GRAND BLVD. DETROIT, MICH. Represented in Canada by

HI-SPEED TOOLS, Ltd. Galt, Ont.



Accessories for Screw Machines

Ahlberg Sound-Insulated Pillow Blocks

Meeting a demand for noiseless antifriction efficiency on many applications where the cost of ball bearings has heretofore been prohibitive, Ahlberg offers the new ED-R series Pillow Blocks.



Designed for light duty, these units are low in cost, though substantially constructed to meet the needs of light service on many types of equipment where quiet operation is desirable. The precision CJB bearing in the ED-R design pillow block is insulated from the metal housing by a molded cushion of Neoprene.

The seals, also of Neoprene, are of a floating construction which eliminates friction and gives both seals and bearings longer life. Ample provision is made for normal misalignment. The bearing is electrically grounded. Housings are solid die-castings, compact and clean-lined. Shaft sizes are ½", ½", ¾", 15/16", and 1".

Bulletins giving prices and complete specifications are available on request from Ahlberg Bearing Co., 3025 West 47th St., Chicago, Illinois.

ERRINGTON MECHANICAL LABORATORY

MAIN OFFICE AND WORKS: STATEN ISLAND, NEW YORK

Chicago Office: 6422 N. RICHMOND STREET New York Office: 200 BROADWAY Boston Office: 830 OLD SOUTH BLDG.





STURDY BUILT--

for Long, Hard Service

A complete line—6* to 12*; Bench and Pedestal Types; All Heavy Duty, Ball Bearing; Price range, \$20.50 to \$175.00.

1 YEAR GUARANTEE.

ABOVE, No. 548, ¼ H. P. \$ 20.50 AT RIGHT, No. 121, 2 H. P. \$175.00

> BALDOR ELECTRIC COMPANY 4368 Duncan Ave., St. Louis, Mo.

BALDOR
BEARING GRINDERS



Van Dorn Drill Stands

Van Dorn has redesigned two of its drill stands so a s t o accommodate several newly redesigned tools.

The smaller stand will accommodate the entire range of end - handle tools from the Holgun up to the 3/4" Utility, the Scrugun Nos. 12 and 22 Screw Drivers and No. 22 Tapper. The larger stand will accommodate the new 1/2" Utility Drill, the new %" Heavy Duty

Drill, and the ½" Junior and previous model ½" Standard Drills.

These two stands together with a larger one cover the entire range of drill sizes, in addition to screw drivers and tappers; and are available as bench, post and pedestal drill stands.

For additional information, please address The Van Dorn Electric Tool Co., Towson, Md.

Clark Introduces Steel

Clark Introduces Steel Weld Truck

Pressed steel channels supporting the deck which has a perfectly smooth surface, turned down sides and smooth edges are outstanding developments incorporated in the new Clark Steel Weld Truck, manufactured by the All Steel Welded Truck Corp., Rockford, Ill.

These unusual features provide the greater capacity and sturdiness of steel yet the truck is comparable in weight and cost to wood. Another advantage of the steel channel construction is the prevention of deck sag under any normal load, at the same time allowing the use of a light gage deck. According to the manufacturer, the truck weighs less than the conventional heavy duty wood truck and is as strong.

The fabrication being electric welded practically eliminates any possibility of its coming apart. It is adaptable to the Clark Lift Jack or as a flat factory truck, having as standard equipment semi-steel or rubber tired wheels equipped with roller bearings and pressure grease fittings. The casters are all steel double row ball bearing with machine races. The truck is available in various standard sizes.

GROUND BY HAND

Much the same process used by the skilled glass-cutters of past generations is employed by the skilled Severance craftsmen in grinding Midget Milling cutters, tubeburring cutters and chatterless countersinks. Because they are ground from the solid

after hardening, they cut cleaner, sharper chips, give more hours of efficient performance, and may be reground an unlimited number of times. Write for catalog.





Severance Tool Manufacturing Co.
1518 East Geneses Ave. Sugmow, Mich.



"CHAMPION" Steel Racks

Save time, steps and money by keeping bar stock, shafting and pipe out of the way and off the floor.

Write for full details.

The Western Tool & Mfg. Co. Springfield, Ohio

QUALITY AND WORKMANSHI SUPERIOR

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SQUARE BASE SHAPER VISE

The Shaper Vise has graduated base and tongue in center to fit slot in table, and has holes for bolting down. In ordering this vise give size of slots in Shaper Table, also distance from center to center of slots.

10" jaws, 2½" deep, opens 1½". Weight 125 lbs. \$44 Our complete line includes Vises for Drill Presses, Milling Machines, Shapers and Grinders.

Prices are net, f. o. b. Chicago. Write for illustrated folder today. Dealers wanted in unoccupied territory.

J. E. Plunket Machine Co. 1823 W. Lake Street Chicago Illinois

Just What You Have Been Wanting-An Economical Live Ball and Roller Bearing Center.



For Lathes, Hand Screw Machines, Grinders, and Mills

- 1. Simplicity and sturdiness adapt this center to heavy duty with extra long life.
- Sufficient bearings for radial, thrust, and alignment loads resulting in 50% more radial load than the average live center.
- 3. Large spindle, small head, and short overhang spells rigidity-result, no chatter.
- 4. Has special oil seal to retain lubricant and resist foreign matter.

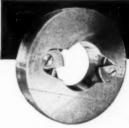
A folder giving prices and complete detail will be mailed to you just for the asking.

A lower first and last cost. Let us prove it by sending you one today for a ten day trial, and if not satisfactory in every way return it.

MOTOR TOOL MFG. CO. 12281 Turner Ave.,

Detroit, Mich.





Self Centering ... Quick Acting ... No Slip. Attaches to any chuck plate or spindle. Provides a slip-proof, balanced drive reducing chatter. Handles rough forgings or turned pieces-straight or taper. Eliminates dogging time. Reduces tool breakage. Write for details and size range.

SENECA FALLS MACHINE CO., 314 Falls St., Seneca Falls, N. Y.

Farrel-Sykes Gear Generator

Executives and engineers of plants using or making gears will find a great deal of helpful information in the new bulletin No. 442, issued by Farrel-Birmingham Co., Inc., 344 Vulcan St., Buffalo, N. Y.

This bulletin describes in detail the latest type of Farrel-Sykes gear generator for generating gears up to 25" diameter and explains the advantages

the machine offers for high speed production of precision herringbone gears and other types of gears used for connecting parallel axes. The bulletin also describes the features of design and its precision construction which make the machine practically noiseless even when operating at high speed, at the same time enabling it to generate high precision gears rapidly and economically and to improve the accuracy of commercial gears without increasing their cost.

Automatic features of the machine are described which reduce the operator's work to placing a blank in position, pressing a starting button and removing the gear after the teeth are cut, permitting him to attend two to four machines. It also contains tabulations giving specifications and capacities of the 2-C and other sizes of Sykes gear generators.

The bulletin is handsomely printed in three colors on coated paper and contains many photographic illustrations of different types of gears that can be produced on the machine, as well as details of the machine itself and diagrams showing various methods of generating different types of gears.



TANNEWITZ Abrasive Cut-off Machine

Uses Abrasive Wheels or Saws, and instantly swivels and cuts any angle from 45° left to 45° right, doing clean, instantaneous work on metal bars, shapes or tubes.

THE TANNEWITZ WORKS Grand Rapids, Mich.

TANNEWITZ DI-SAW SAVES AN AVERAGE OF \$4.80 EACH HOUR IT'S USED



Inside and outside cuts on
dies, shoes,
templets and
endless other
jobs can be done
in a s mall
fraction of the
time required
by former methods. Saws, files
and polishes. A
highly developed, large capacity machine.

Write for literature.

THE TANNEWITZ WORKS
GRAND RAPIDS - MICHIGAN

Roxite Floor Material

Flexrock Co., 2300 Manning St., Philadelphia, announces Roxite.

Roxite is "Diabase" and "Black Quartz" quarried, — crushed, — pulverized,—washed free of vegetable matter, animal matter, silt, loam, clay or foreign matter,—graded for "size harmony" with unnecessary sizes discarded,—kiln dried (bone-dry) — dust blown off, packed in 100 lb. waterproof bags.

Roxite is said to be hard enough to cut glass,—and tough enough to withstand an impact that will crush ordinary quartz.

Its major use is in the field of installing and maintaining floors. Roxite is recommended for use with any floor patching material — with high early strength cements,—with portland cement,—and especially with any mastic floor patching material.

Rockford Spring-Loaded Clutches



and Pullmore Clutches Used in Baker Trucks

plaker Industrial Trucks, one of which is shown at left, must carry heavy loads up steep inclines, make long hauls fast, maneuver in narrow aisles, work long hours. This severe service demands drive and lift clutches that are powerful, compact, reliable, durable and economical. To meet these requirements perfectly, Baker Trucks have a Rockford Spring-Loaded Clutch controlling the main drive, and a Pullmore Clutch for operating the lift. Rockford Industrial Clutches are made in Spring-Loaded and Over-Center Types; with single or double drive plates, for operation in oil or dry, in capacities ranging up to 80 h.p. at 100 r.p.m. Spring-Loaded Clutches

operate like an automobile clutch. Over-Center Clutches remain positively engaged or disengaged until changed by operator. Pullmore Multiple-disc Clutches are made in many sizes; and capacities up to 75 h.p. at 500 r.p.m. Write, today, for complete information.

ROCKFORD DRILLING MACHINE DIVISION Borg - Warner Corporation, 410 Catherine Street, Rockford, Illinois



STEEL

ROTARY

CUTTERS

Ground From Solid

MANY SHAPES AND SIZES



HIGH SPEED STEEL ROTARY FILES HAND CUT



HIGH QUALITY ONLY



Builders of Flexible Shafts and Machines for Thirty Four Years.

SEND FOR CATALOG



Sixty Types and Sizes. PAY MORE GET MORE IT PAYS.

BUY ON QUALITY NOT ON PRICE.



N. A. STRAND and CO

5001-5009 NO. WOLCOTT AVE.,

CHICAGO

Owen Welding Machines

Owen Electric Mfg. Co., Fayetteville, N. C. announces a new oscillating current transformer type electric welding machine.

Features claimed include:—high efficiency—high power factor and ease of operation; combined with excellent welding qualities on ferrous and nonferrous metals.

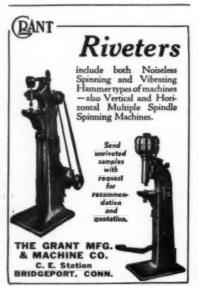
The machine accommodates all types of electrodes used commercially with both A. C. and D. C. equipment.

The stepless range of machine at 65 volts is 20 to 445 amperes. Any desired setting is obtained by turning hand wheel attached to movable reactor core.

The excellent performance of the welder is attributed to a system utilizing inductively, oil-filled condensers, in both primary and secondary circuits, which are automatically thrown



in and out. The system is available on a license basis.



IT'S HERE!

Beverly B-3

Throatless Shear

A New Heavy
Duty Bench Type



Maximum shearing capacity— 3/16" mild U.S. steel or 10 gauge stainless. Supplementing Models Nos. 1 and 2.

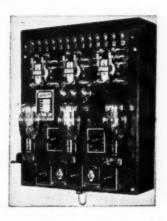
Reasonably priced-send for descriptive circular

THE BEVERLY SHEAR CO.

"Shear it cleverly—with a Beverly"

Weltronic Electric Welding Timers

Following a year of successful operation of experimental installations in regular production on varying types of welding installations in a number of different plants Weltronic Corp., Detroit, announces the commercial availability of its line of electronic welding timers.



Designed for use with gun, spot, projection and automatic welding equipment, the line comprises models ranging in application from single spots to multiple automatic spot welding. It is claimed that 600 spot welds per minute in regular production have been made with these new timers.

The use of electronic tubes reduces the number of moving parts to such an extent that but a single relay and a single tube are required for full automatic control of a gun, spot, or automatic welding machine. Their use permits the selection of virtually any combination of welding factors desired.

Of particular interest is the controlled interrupted time model, permitting the welding of extremely heavy (thick) sections, heretofore considered impossible to weld. With the new Weltronic timers and modern hydraulic spotwelding equipment, sections up to ½ inch thickness each are being welded together successfully in regular production.

The exact setting of cycles of welding current possible with these timers is said to be of particular value in the spot welding of hard-to-weld metals such as stainless and low-tensile steels, etc.—permitting the making of perfect welds without burning of the material.

Please address the makers for complete information.

PRECISION ATTACHMENTS



Dividing Heads Circular Tables Univ. & Vertical Heads Vises, Arbors, etc. Service parts.

Write for prices & circulars

THE KEMPSMITH MACH. CO.

IT TURNS WITH THE WORK



8 years continuous use has proved its value.

Sturdy radial and thrust bearings insure rigidity and load capacity.

Write for catalog and free trial offer:

STURDIMATIC TOOL CO. 5224 THIRD, DETROIT

Linley Offers Another Model

A micrometer screw feed quill is the newest feature of the Linley High Speed Milling Machine and Jig Borer manufactured by Linley Brothers Co., 11 Montauk St., Bridgeport, Conn. Direct reading eliminates the necessity of pencil figuring and possible errors. Screw feed quill assures smooth boring accurately to any predetermined depth

Write for details

YOUR Hammers with the FIELD MOULD and LADLE Low cost, simple operation.

JOHNSON TOOL CO., Inc. 65 Massassit Aye., EAST PROVIDENCE, R. I.



SOCKET HEAD

SAFETY HOLLOW SET SCREWS

MADE OF ALLOY STEEL MILLED FROM BAR

Try Them On Your Next Job! Or Write For Samples Today.

MACHINE PRODUCTS COMPANY

5207 Lawrence Ave., Chicago, III.

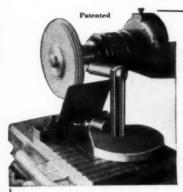
up to three inches.

This new machine, it is said, is unsurpassed for small work such as dies, jigs, fixtures, model work, molds for



plastics, metal pattern work and all types of work on laying out, drilling, milling and boring operations. The table is equipped with two adjustable stops, also a lock. The lock is provided on the saddle. A standard ½" T slot runs the full length of the table for clamping tools, work, etc.

Heavy duty V-belts are used on a compound drive which provides eight spindle speeds. The compound pulley is mounted on an adjustable bracket. The motor bracket is also adjustable for the belt take-up. A reversing switch is provided to operate the motor in either direction for right or left hand mills. The machine is ball bearing equipped throughout.



Reduce Hours

to Minutes

with the "BK" Wheel Contour Dresser

You save time and you avoid the bother of complicated set-ups and exacting measurements with the "B-K" Wheel Contour Dresser. No special skill or attention is required to dress wheels exactly in accordance with templates.

You can grind form cutters profitably from the solid. There's no question about accuracy in the duplication of parts. There are no tedious adjustments—no loose fixtures or accessories. Adapted to any grinder carrying an 8-inch or smaller wheel. Write for descriptive folder and price.

BRICKNER-KROPF MACHINE CO., Muskegon Heights, Mich.



There's Saving - Quality in TRIPLEX Stove Bolts

They put speed in your assembly line with their time-saving fit, deep head slots, quick-starting nuts. Round, flat or oven head, all sizes—made of high quality wire. Cleaned, ready to use. Ample stock ready for quick shipments. It's smart buying to specify Triplex.

Write or wire today for samples and prices.

THE TRIPLEX SCREW CO.

CAP AND SET SCREWS, BOLTS, NUTS AND RIVETS

5377 Grant Avenue • Cleveland, Ohio

Millions Sold-Used in Every Industry

Sheffield Indicator Plug Gage

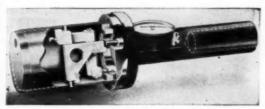
and gage are minimized.

The Reed mechanism, used so effectively in the Sheffield visual I gage, has now been applied ingeniously in the construction of an indicator plug gage.

The principal function of this gage is checking cylindrical bores during the finishing operation and while they are still set up on the finishing machine, to determine

the correct amount of machining. However, the gage is equally useful for final inspection. It can be read to "tenths" and interpolated to fractional tenths.

There are two gaging points diametrically opposite each other, both freely moving in correlation with each other. Thus any irregularity on either side of the bore is instantly indicated on the dial and correctly evaluated and the effects of thrust pressure between part

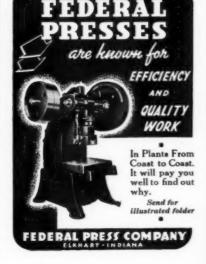


Another attractive feature is the ability to check a bore beyond a pilot sleeve, which may be as much as ten thousandths smaller in diameter than the bore itself. No pressure pads or wear strips are required and the two floating contact points and makes any condition of bell mouth, taper, sags or ridges immediately apparent on the dial scale.

Sheffield Gage Corp., Dayton, O., will gladly supply further details.



3165 FULTON RD.



"THE 3™ HAND"



LEEDS FOOT SWITCH

For Motor-driven Tools. Safe, Convenient, Inexpensive,

Write for Folder 231.

THE WALTON 95 Allyn St.,

Hartford, Conn.

ABRASIVE WHEEL DRESSERS



KEEP GRINDING WHEELS SHARP AT LOW COST. SPECIAL DRESSER FOR SURFACE GRINDER GIVES HEAVIER CUT WITHOUT BURNING.

SEND FOR CIRCULAR

M & S DRESSER 377 CORNWALL ST., HARTFORD, CONN.

THIS EVER-READY ALL PURPOSE UTILITY UNIT Cleans EVERYTHING ANYWHERE in

TORNADO Portable Industrial BREUER'S Ball Bearing

A marvelous piece of cleaning equipment—compact (weighs only 40 lbs.) and powerful (1 HP Motor) with every up-to-the-minute improvement for performing its three major services.

SPRAYS VACUUMS BLOWS

Cleans floors, walls and shelves, overhead pipes, boiler tubes. Cleans castings, picks up water, **reclaims waste materials**. Power unit quickly removable for blowing dust and dirt out of motors and machinery and for reaching the hard-to-reach places; also for spraying insecticides, paints, etc.

Write for literature and for FREE TRIAL OFFER

BREUER ELECTRIC MFG. CO. 5108 No. Ravenswood Avenue Chicago, III.

TAKE THE BALL BEARING DUST DUT INDUSTRIAL VACUUM CLEANER

It costs you MONEY to be without this TIME and LABOR Saver, but costs you nothing until you see how it works UNDER YOUR CON-DITIONS.



Thor Bantam Grinder

A new rotary air grinder for smallwheel work, known as the Thor "Bantam" is announced by the Independent Pneumatic Tool Co., 612 West Jackson Blvd., Chicago. It is but 51/2" long and weighs 18 ounces.

Operating at a Free Speed of 14,-000 r.p.m. the "Bantam" is suitable for use with a wide variety of accessories. Mounted abrasive wheels in all shapes and sizes from the smallest pointed wheel up to 11/2" diameter round wheels can be used efficiently. Other accessories such as rotary files and steel cutters, sanding discs, wire brushes, saw blades, and buffing and polishing wheels can also be used.

In addition to its convenience and adaptability for precision work, the "Bantam" has power for continuous service on hard jobs. Because it is air powered, the "Bantam" offers the additional advantages of holding a nearly constant speed under load, with virtually no power waste. Low air consumption assures low operating cost and simplified design reduces wear, resulting in low maintenance cost.



Standard equipment includes a Push-Button Throttle that may be locked for continuous operation; 1/4" collet and swivel hose connection. Lever throttle may be had in place of push but-ton, if desired, and the adaptor for collet can be replaced by an Adaptor with chuck.

Further information may be had by writing to the company for Bulletin

HIGH AS THE STARS IN QUALITY



STAR Products have a background of 25 years of manufacturing experience in this very specialized field of electrical equipment. It would be difficult to duplicate quickly, the sum total of experience and knowledge which the STAR Organization represents.

Consult us regarding your needs in Electric Motors of all kinds. Generators, Dynamos, Converters, Gear Motors, Brake Motors - special designs to meet your needs.

AC & DC Motors Up to 250 H.P.

* STAR ELECTRIC MOTOR CO., Bloomfield, New Jersey





there is a difference that you'll notice in the performance . . . due to accuracy of manufacture . . . careful selection of material . . . skillful heat treatment. Threadwell's stand up on long, hard, tough tapping jobs. The're uniformly good and absolutely dependable.

Available in Regular, Special, Carbon, High Speed—Cut and Ground Threads. Also Threadwell Keyway Cutters, Dies and Screwplates. Write for catalog No. 10.

THREADWELL TAP & DIE CO.

GREENFIELD, MASS.

MOTORIZE WITH THE NEWER "TORQ DRIVE"

"the drive with all the features"

- Variable Belt Tensioner Gives Instant Adjustment In Any Degree.
- All Steel Welded Column.
- Neat Appearance.
- Self Aligning Ball Bearing Housings.
- Rigid and Vibrationless.
- All Parts Interchangeable.
- Easily Installed-(Only 4 Bolts.)

Torq drives have proven their value in industry—showing substantial gains in production—decreases in power bills—and resultant increases in profit—Torq drives are available in sizes from 1-10 HP for Lathes, Screw Machines, Milling Machines, Shapers, Drills, Punch Presses, and other standard machinery.

WRITE FOR LITERATURE TODAY

THE TORQ ELECTRIC MFG. CO., 6606 Carnegie Ave., CLEVELAND, OHIO

New Coatings for Magnesium Alloys

The development of new protective and decorative coatings for magnesium alloys is announced by The Dow Chem-

ical Co., Midland, Mich.

According to Dow technicians, two of these coatings known as Treatments Nos. 7 and 8 surpass other known treatments in protecting magnesium alloys against salt water, and upon general atmospheric exposure result in satisfactory adhesion surfaces for subsequent paint systems. Since they introduce no dimensional change, the new treatments may be used on parts machined to close tolerances.

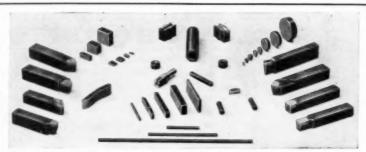
Treatment No. 7 is usually applied to Dowmetal parts after they have been machined. Dow research men claim that all surfaces, even deep holes, treat equally well. The treatment imparts a dark brown to black finish on most alloys, and may be used on all except Dowmetal M. It finds its greatest application in the aircraft field.

Treatment No. 8 may be used on all alloys and forms including Dowmetal M. It is said that this treatment does not affect machined dimensions and leaves machined surfaces with their original lustre. Complete treatment is obtained on all surfaces, including the bottoms of deep holes. Tidewater tests recently completed at Miami, Fla., show Treatment No. 8 to be superior to the Chrome-Pickle in protection against salt water corrosion.

Another Dowmetal protective coating, by means of which various colors can be produced, is known as Dow No. 6. It is in reality a dye coating produced in water solutions at high temperatures and pressures. The coating can be furnished in colors ranging from yellow, red, blue, and green, to metallic lustres such as bronze and brass. Its greatest use is for decorative treatments and it may be used to protect parts which cannot be conveniently painted.

Some measure of success also has been attained in experimental electroplating of Dowmetal. Although this is not in commercial use at the present time, it appears to have considerable

promise.



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Heavy Duty Carter Bench Shaper

A new Bench Shaper, No. C51 has been announced by The R. L. Carter Division, New Britain, Conn. A 1h p. combination Router-Shaper motor. operating at 18,000 r.p.m., is held under the table in a holder which can be tilted from a vertical position to any



angle up to 45°. With the motor tilted to various angles and with three cutters used singly or in combinations of 2 or 3, it is possible to make over 500 different kinds of cuts.

The table top provides a working surface large enough for practically all shaping work. It measures 16" x 26". The table is made so that wood extensions can be attached if additional surface is needed.

The table top is drilled to accommodate an adjustable straight fence, tension shoe, light fixture and circular guide. The cast iron legs have drilled bolt holes for anchoring the shaper to a bench.

A regular switch is on the right front leg. An overload switch which throws out the regular switch, stopping the motor when it is overloaded, is also on the front of the table.

The same motor used in C51 Bench Shaper, can be used in a Plain Base for routing, grooving, veining, inlay and templet work. An adaptor can be used in place of the shaper spindle to take router bits.

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Timken roller or ball bearings to spindle

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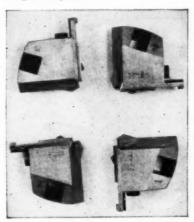
16 gauge, drop handles both ends. Corners reinforced, 12 wide x 20 long x 10 deep.

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POLLARD BROS. MFG. CO. 5505 Northwest Highway, Chicago, Ill.

J. & L. Offers New Chaser Holders

It is announced that new Chaser Holders are now available for the Model 22 Jones & Lamson Tangent Die Head. These Chaser Holders will increase the capacity of this die and make it very versatile when used on Hand Screw Machines and Turret Lathes where the job changes are frequent and a die with a large threading range is required.



The Model 22 can now be furnished with Chaser Holders ½" to ¾" capacity (these holders take the standard Model 21 Die Chasers) and with Chaser Holders of ¾" to 1¼" capacity.



Each set of holders will accommodate any diameter and pitch thread within the capacity of the die. Chaser Holders with a capacity of 1½" to 1½" are also available for use with this same die.

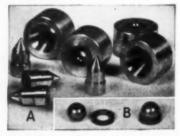
Jones & Lamson Die Heads have proven their value in quantity production. For small lot threading the Model 22 with two sets of Chaser Holders is recommended giving a capacity for any diameter and pitch right hand thread from ½" to 1¾". Model 21 Die Chasers can be used in this head. All Chasers are ground in the thread form after hardening.

Two new Die Heads, the 16S and the 16SB are announced. The former is designed for small hand screw machines. It is provided with an adjustable pull-off and a hand locking lever.

The 16SB die has an external trip and is recommended for use on No. 0 and No. 00 B. & S. Automatics. This die is designed to prevent opening during the indexing movement on high speed machines.

Kennametal Valve Parts

Pump valves and other valves subject to unusual abrasive or corrosive action are now being successfully made of Kennametal, the new intermetallic compound of tungsten-titanium carbide, manufactured by McKenna Metals Co., 135 Lloyd Ave., Latrobe, Pa.



Illustrated in Fig. 1-A are several high pressure needle valves, equipped with Kennametal needle tip and seat, which were used in experiments involving a tarry fluid containing grit. It is said that previously, it had been

necessary to change as many as seven valves in 24 hours. However, the Kennametal-tipped valves and seats gave such good service that it was necessary to replace only one valve every one to two weeks.

The superior strength of Kennametal balls and seats for oil well pump valves (see Fig. 1-B) is demonstrated by tests recently conducted by a large oil well equipment manufacturer. In these tests Kennametal balls were hammered against seats of Kennametal by a pneumatic hammer, using 300 blows per minute of ram, 25 lbs. per sq. in. air pressure and 3/32 in. play between ram and ball and seat. After 105 minutes of hammering, it is reported that the valves were still serviceable. The Kennametal valves also showed superior resistance to corrosion in the waters of Louisiana oil wells.

Kennametal can be supplied in any desired shape for valve parts and in three grades having varying physical properties. Complete information on Kennametal balls for ball valves will be sent by the manufacturer upon request.

-GEARS-

Spur – Helical – Worm – Bevel – Miter, Etc.

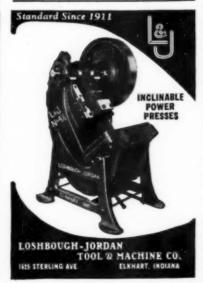
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Ultra-Chex Precision Length Standards

The George Scherr Co. has just placed upon the market a new set of precision measuring standards under the trade name of Ultra-Chex. The set consists of nine standards which are asserted to be within 8 millionths of an inch. These will make 71 combinations in steps of 1/16" up to 4 7/16" and 41 combinations in steps of .100" up to 4.1".

Of special interest is the fact that this set is available for a very reasonable price, placing high precision ac-curacy within reach of the smallest shop.

Also available with the Ultra-Chex set is the Scherr Optical Parallel, accurate in planeness within 4 millionths. This is used to check the parallelism of micrometer anvils by observing light interference bands on both anvils.

A new six-page folder has been is-

sued showing various uses of the Ultra-Chex in actual toolmaker's and shop



work, such as checking lead accuracy of micrometers, inspecting and setting micrometers, setting height gages and adjustable snap gages, and setting and inspecting measuring machines and Copies may be obmachine tools. tained from the George Scherr Co., Inc., 122 Lafayette St., New York.

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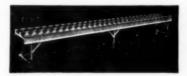
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Open Width % to 6 Gage Material .040 to .125
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Lengths to 120

Aluminum Conveyor

A new roller-type portable conveyor made of 61 S. T. Alcoa Aluminum, featuring high tensile strength combined with light weight, is offered by the Aluminum Ladder Co., 126 Adams St., Tarentum, Pa.

The model illustrated is equipped with steel ball bearing wheels fitted on



an eccentric axle at each end of the conveyor. When the wheels are in a "down" position, the conveyor is easily rolled from place to place; when they are lifted up, the conveyor rests firmly on the floor. Due to the light weight of aluminum, only one or two people are needed to change location of the conveyor.

The conveyor can be supplied with or without legs and with or without wheels on the legs. The model shown is 10' long, 14" wide, and weighs only 60 lbs. The various types are available in varying widths, lengths and heights to suit different needs.

Duro Power Driven Machinery

An attractive new two color catalog No. E-39-A, introduces the full complement of Duro Tools in attractive fashion. The 48 page pages (8½x11") are bound with a trick fold which opens to twice that size.

One at a time, the production table saw, jointer, combination saw and jointer, band saw and router-carver-shaper are presented. Also single and multiple drills, lathes, sander, scroll saws, shaper, grinders, flexible shaft equipment. In fact, all the numerous members of the whole Duro family are shown in large illustrations, including attachments and the text is easily read and interesting.

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Bulletins on request.



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The Torq Electric Mfg. Co., Cleveland, Ohio
Westlof Tool & Mfg. Co., Detroit, Mich.

Drives, Machine Tool
Drives, Machine Tool
Drive-All Mfg. Co., Detroit, Mich.
The Torg Electric Mfg. Co., Cleveland, Ohio
Westlof Tool & Mfg. Co., Detroit, Mich.

Drives, Punch Press the Torq Electric Mfg. Co., Cleveland, Ohio

Drives, Shaper & Mch. Co., 5943 Ravenswood, aslity Hdwe. & Mch. Co., 5940 Ravenswood.

Chicago
be Torq Electric Mfg. Co., Cleveland, Ohio
estlof Tool & Mfg. Co., Detroit, Mich.

Drives, Turret Lathes
e Torq Electric Mfg. Co., Cleveland, Ohio

Elevating Tables

Elevating Tables

Minited Tool & Engineer. Co., Dayton, Ohio

Minited Tool & Engineer. Co., Dayton, Ohio

Enery Wheel Dressers and Gutters

Western Tool & Mig. Co., Springfield, Ohio

End Mills End Milis
Glenzer Company, J. C., Detroit, Mich.
Master Tool, Co., Cleveland, Ohio
Progressive Tool & Cutter Co., Ferndale, Mich.
Renu Tool Company, Detroit, Mich.
Victor Mchy, Exch., 251 Centre, N. Y. C.
Engraving Machines
Gortion Machine Co., Geo., Racine, Wis.
Luma Electric Equipment Co., Toledo, Ohio
Printz Electric Co., Detroit, Mich.
Buffalo Forge Company, Buffalo, N. Y.
Experimental Work
American Tool Works, Inc., Hartford, Conn.

Tap Extractors, Tap Walton Co., Hartford, Conn.

Facers, Spot Circle Tip Tool Corp., East Orange, N. Glenzer Company, J. C., Detroit, Mich.

Feed Fingers for Auto. Screw Machines Modern Collet & Machine Co., Ecorse, Mi Machine Products Div., Elmira, N. Sutton Tool Co., Detroit, Mich.

Files. Oliver Instrument Co., Adrian, Mich. Victor Mchy. Exch., 251 Centre, N. Y. C.

Rotary Files, Rotary
Ford Mig. Co., M. A., Davenport, Iowa
Grobet File Corp. of America, 3 Park
New York, N. Y.
Hamilton Tool Company, Hamilton, Ohio
Pratt & Whitney Div., Hartford, Conn.
Severance Tool Mig. Co., Saginaw, Mich. Files.

Filing Machines Fring macrines Continental Machine Specialties, Minneapolis Grob Brothers, Grafton, Wis. Harvey Mig. Co., 161 Grand St., New York Mall Tool Co., 7742 S. Chicago Are., Chicago, Ill. Oliver Instrument Co., Adrian, Mich.

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Filing Room Equipment
Wardwell Manufacturing Co., Cleveland, Ohio

Fixtures Knu-Vise, Inc., Detroit, Mich.

Flexible Couplings Lovejoy Flexible Coupling Co., 5026 Lake, Cligo.

Flexible Shaft Couplings Lovejoy Flexible Coupling Co., 5026 Lake, Chgo.

Flexible Shafts and Accessories
Haskins Co., R. G., 623 S. California, Chicago
Mail Tool Co., 7742 S. Chicago Are, Chicago, III.
Stow Mig. Company, Binghanton, N. Y.
Strand & Co., 5001 N. Wolcott, Chicago
Walker-Turner Company, Plainfield, N. J.
Wyzenbeck & Staff, Inc., 838 W. Hubbard, Chgo.

Flexible Shaft Machinery
Haskins Co., R. G., 623 S. California, Chicago
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Pratt & Whitney, Hartford, Conn.
Strand & Co., 5001 N. Wolcott, Chicago
Wyzenbeek & Staff, Inc., 838 W. Hubbard, Chgo.

Floating Holders Glenzer Company, J. C., Detroit, Mich.

Floating Holders, Parallel Float Apex Mch. & Tool Co., Dayton, Ohio Floating Holders, Parailel & Rad. Apex Meh. & Tool Co., Dayton, Ohio

Flue Lathes Marshalltown Mfg. Co., Marshalltown, Ia. Flue Welders Marshalltown Mfg. Co., Marshalltown, Ia.

Forgings Carpenter Steel Co., Reading, Pa.

Forming Tools Circle Tip Tool Corp., East Orange, N. J. Michigan Tool Co., Detroit, Mich. Morrison Machine Products Div., Elmira, N. Y. Furnaces, Industrial Strong, Carlisle & Hammond Co., Cleveland, O.

Furniture, Machine Shop Standard Pressed Steel Co., Jenkintown, Western Tool & Mfg. Co., Springfield, Jenkintown,

Gages Ames Co., B. C., Waltham, M. Hammond Mchy, Builders, K. Vinco Tool Co., Detroit, Mich. C., Waltham, Mass. ny, Builders, Kalamazoo, Mich.

Gages, Pin. Piug, Ring and Snap American Tool Works, Inc., Hartford, Conn. Gages, Pressure

Marshalltown Mfg. Co., Marshalltown, Ia. Gases, Spring Stock Knu-Vise, Inc., Detroit, Mich.

Gages, Taper Hartford Special Machinery Co., Hartford, Conn.

Abart Gear & Mche. Co., 4832 W. 16th St., Chgo. Taylor Machine Co., Cleveland, Ohio

Taylor Machine Co., Chevena, Generators, Motor Chicago Elec. Co., 1330 W. Cermak Rd., Chgo. Lincoln Electric Co., Cleveland, Ohio Star Electric Motor Co., Bloomfield, N. J.

Grinders, Bench Grinders, Bench
Baldor Electric Co., St. Louis, Mo.
Cincinnati Electrical Tool Co., Cincinnati, Ohlo
Hammond Mchy. Builders, Kalanazoo, Mich.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Istanley Electric Tool Div., New Britain, Coun.
Vonneaut Moulder Corp., Indianapolis, Ind.
Walker-Turner Company, Fainfield, N. J.

Grinders, Disc Cincinnati Electrical Tool Co., Cincinnati, Ohio Gaston Power Tools Co., Evergreen Park, Ill. Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill. Oliver Machinery Co., Grand Rapids, Mic. Wyzenbeek & Staff, Inc., 838 W. Hubbard, Chgo.

Grinders, Flexible Shaft
Haskins Co., R. G., 623 S. California, Chicago
Mall Tool Co., 7742 S. Chicago Ave., Chicago,
Stanley Electric Tool Div., New Britain, Com.
N. A. Strand & Co., 5001 N. Woolott, Chicago

A. A. Strand & Co., Just A. Rossan, A. Strand & Co., and C. R. Strand & Co., 1101 W. Monroe St., Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill. Cincinnati Electrical Tool Co., Cincinnati, Ohio Dumore Co., Racine, Wis.

Duro Metal Froducts Co., 2651 N. Kildare Ave., Williago, C. 7742 S. Chicago Ave., Chicago, Ill. Skilsaw Inc., 3304 Eiston Ave., Chicago, Ill. Skilsaw Inc., 3304 Eiston Ave., Chicago, Ill.

Grinders, Heavy Duty Cincinnati Electrical Tool Co., Cincinnati, Ohio Lempco Products, Inc., Bedford, Ohio Vonnegut Moulder Corp., Indianapolis, Ind.

Grinders, High Speed Bridgeport Machines, Inc., Bridgeport, Conn. Chicago Wheel & Mg. Co., 1101 W. Monroe St., Chicago, Ill. Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.

Mali 1001 Co., 1772 Grinders, Padestal Electric Raldor Electric Co., 8t. Louis, Mo. Cincinnati Electrical Tool Co., Cincinnati, Ohio Hammond Mchy. Builders, Kalamazoo, Mich. Grinders, Precision

Dumore Co., Racine, Wis.

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Grinders, Production Surface Gallmeyer & Livingston Co., Gr. Rapids, Mich.

Grinders, Snagging Cincinnati Electrical Tool Co., Cincinnati, Ohio

Grinders, Surface, Auto. Feed Gallmeyer & Livingston Co., Gr Reid Brothers Co., Beverly, Mass. Gr. Rapids, Mich.

Grinders, Swing Frame Vonnegut Moulder Corp., Indianapolis, Ind.

Grinders, Univ. Tools & Cutter LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio Grinding Attachments, Drill
Atlas Press Co., Kalamazoo, Mich.
Carlson Mg. Co., C. H., Minneapolis, Minn.
Mall Tool Co., 7742 S. Chicago Are, Chicago, Ill.
Oliver Instrument Co., Adrian, Mich.

Grinding, Centerless (Contract)
Eastern Centerless Grind, Co., Hartford, Conn.
Heim Company, Fairfield, Conn.

Grinding Machines, Belt Walls Sales Corp., 96 W. Warren St., New York

Grinding Machines, Cutter, Reamer and Tool
Brown & Sharpe Mfg. Co., Providence, B. I.
Gallmeyer & Livinsston Co., Gr. Rapids, Mich.
Hammond Mehy, Blders, Kalamazoo, Mich.
Lee & Son, K. O., Aberdeen, S. Dak,
National Machine Tool Co., Racine, Wis,
Oliver Instrument Co., Adrian, Mich.
Proser & Son, 120 Wall St., New York, N. Y.

Grinding Machines, Portable Electric icago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill. Chicago Wheel & Mrg. St., Chicago, Ill. St., Chicago, Ill. St., Chicago, Ill. Chicago, Chicago

Duro Metal Products Co., 2004 Chicago, Ill. Haskins Co., R. G., 623 S. California, Chicago Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill. National Machine Tool Co., Racine, Wis. Pratt & Whitney, Hartford, Com., Y. Stand, C. Chicago, Ill. Chicago, Ill. Chicago, Wheel S. Chicago, Wheel & Mg. Co., 1101 W. Monroe St., Chicago, Ill. Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.

Grinding Wheels
Chicago Wheel & Mfg. Co., 1101 W. Monroe
St., Chicago, Ill.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Mack Saw Blacs
Armstrong-Blum Mfg. Co., 5741 Bloomingdale
Ave., Chicago, Ill.
Racine Tool & Mch. Co., Racine, Wis.
Victor Mchy, Exch., 251 Centre, N. Y. C.
Hack Saw Machines
Arustrong-Blum Mfg. Co., 5741 Bloomingdale

Hack Saw Machines
Armstrong-Blum Mfg. Co., 5741 Bi
Ave., Chicago, Ill.
L-W Chuck Co., Toledo, Ohio
Racine Tool & Mch. Co., Racine, Wis.

Hammers, Chipping ister Tool Co., Cley Cleveland, Ohio

Master Tool Co., Cevetand, Onio
Hammers, Forge
Murray Mfg. Co., D. J., Wausau, Wis.
Hammers, Portable Electric
Stanley Electric Tool Div., New Britain, Conn.

Stanley Electric Tool Div., New Britain, Conn Handles, Precision, Machine Cinc. Ball Crank Co., Cincinnati, Obio Hand Saws, Portable Electric Skilsaw, Inc., 3304 Elston Ave., Chicago, Ill., Hand Screw Machine Live Centers Motor Tool Mfg. Co., Detroit, Mich., Hand Screw Machines, Pracision Hardinge Brothers, Inc., Elmira, N. Y.

Handpieces, Reciprocating
Stow Mfg. Company, Binghamton, N. Y.
Heads, Boring Flynn Manufacturing Co., Detroit, Mich.

Heads, Turret
Milliken Machine Co., West Newton, Mass.
Heat Treating
Vincent Steel Process Co., Detroit, Mich.

Hinces, Continuous Steel Auto Moulding & Mfg. Co., 2326 S. Canal, Chgo. Hinges, Plain and Offset Auto Moulding & Mfg. Co., 2326 S. Canal, Chgo.

Hobs Illinois Tool Works, 2501 N. K. Michigan Tool Co., Detroit, Mich.

Chain Hoists—Bought and Sold geman, T. V., Normandy (St. Louis Co.), Mo. Logeman, T.

Hoists, Chain—Serviced Logeman, T. V., Normandy (St. Louis Co.), Mo.

Logeman, ...

Hoists, Electric
Shaw-Rox Crane & Hoist Co., 435 Broadway,
Muskegon, Mich.

Wyzenbeek & Staff, Inc., 838 W. Hubbard, Chgo. Index Centers

Mfg. Co., Providence, R. I. on, Norwood, Cincinnati, Ohio Brown & Sharpe M Wm. Carroll & Son. Wm. Carroll & Son. Norwo L-W Chuck Co., Toledo, Okio Jigs and Fixtures

American Tool Works, Inc., Hartford, Conn. Hamilton Tool Company, Hamilton, Ohio Hartford Special Machinery Co., Hartford, Conn. Joints, Universal

Apex Machine Co., Dayton, Ohio Borgeson Mfg. Co., Torrington, Conn.

Keyseating Machines are & Son, John T., Brooklyn, N. Y.

Burr & Son, John T., Broonyn, S.
Lacings, Belt
Armstrong-Bray & Co., 308 N. Le
Lathe Live Centers
Modern Machine Corp., Brooklyn., N
Motor Tool Mfg. Co., Detroit, Mich.
Sturdimatic Tool Co., Detroit, Mich. & Co., 308 N. Loomis, Chicago

Lathe Brives Cullman Wheel Co., 1359 Altgeld St., Chicago Hardinge Brothers, Inc., Elmira, N. Y.

Lathes, Automatic Blond Mch. Tool Co., R. K., Cincinnati, Ohio

Lathes, Back Geared
Atlas Press Co., Kalamazoo, Mich.
Rivett Lathe & Grinder, Inc., Brighton, Bo
South Bend Lathe Works, South Bend, Ind. Boston

Rivett Lane.
South Bend Latne
Lathes, Bench
Ames Co., B. C., Waltham, Mass.
Atlas Press Co., Kalamazzo, Mich.
Delta Mfg Co., Milwankee, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Hardinge Brothers, Inc., Elmira, N. South Bend, Lathe Works, South Bend, Ind.
South Rend Lathe Works, South Bend, Ind.
Tool Co., Waltham, Mass.

"Fool Co., Waltham, Mass."

"Hale Boring K., Cincinnati, (

Deep Hole Boring Ich. Tool Co., R. K., Cincinnati, Ohio

Lathes, Engine
Blond Meh. Tool Co., R. K., Cincinnati, on
the Bend Lathe Works, South Bend, Ind. LeBlond

Lathes, Gap LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio Hollow Spindle deh. Tool Co., R. K., Cincinnati, Ohio Lathes, Hol LeBlond Mch.

Lathes. Multicut LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio

Lathes, Manufacturing Sundstrand Machine Tool Co., Rockford, Ill.

Lathes, Polishing & Buffing Cincinnati Electrical Tool Co., Cincinnati Hammond Mehy. Ruidlers, Kalamazoo, Hardinge Brothers, Inc., Elmira, N. Y. Cincinnati, Ohio Olicio

Lathes, Precision South Bend Lathe Works, South Bend, Ind. Lathes, Precision Bench

Atlas Press Co., Kalamazoo, Mich. Hardinge Brothers, Inc., Elmira, N. Y. South Bend Lathe Works, South Bend, Ind.

Lathes Screw Outling Mich.

Lathes Screw Outling Mich.

Mich.

Hardinge Brothers Inc. Elmira, N. Y.

South Bend Lathe Works, South Bend, Ind.

Wade Tool Co. Waitham, Mass.

Lathes, Speed

Wade Tool Us. National Co., Cincinnati, Ohio Lathes, Speed Schanter Machine Co., Cincinnati, Ohio Lathes, Toolroom Atlas Press Co., Kalamazoo, Mich, Hardinge Brothers, Inc., Elmira, N. Y. LeBlond Mch. Tool Co., R. K., Cincinnati, C. South Bend Lathe Works, South Bend, Ind.

Blond Mch. Tool Co., R. K., Cincinnati, Ohio uth Bend Lathe Works, South Bend, Ind. Layout Fluid axton Rogers Mfg. Co., Minneapolis, Minu. Layout Tables. Seed. Co., J. C., Milwaukee, Wis. Leaders Pins, Steel Co., J. C., Milwaukee, Wis. Leaders Pins, Steel Co., J. C., Chicago, Ill. Leather Oil Retainers. Mfg. Co., 1860 S. Kilbourn, Chicago

ts Bros. Mig Lights, Shop Mig. Co.

Gits Described and Control of the Co

Nongreit Co. C. A., Denver, Colorado Lubricators, Automatic Lubricators, Automatic Magnetic Chuck Demognetizers Electro-Matic Products Co., 4820 Deming Place, Chicago, III. Mandrels

Mandress
Lee & Son Co., K. O., Aberdess,
Mandrels, Expanding
Nicholson Co., W. H., Wilkesbarre, Pa.
Western Tool & Mfg. Co., Springfield, Ohio
Marking Machines
Ideal Commutator Dresser Co., Sycamore, Ill.
New Method Steel Stamp. Inc., Detroit, Mich.
Schmidt, Geo. T., Inc., 1802 Belle Plaine Ave.
Chicago, Ill.

Meters, Air Velocity Testing Lab., 150 W. Austin, Chicago. III. Testing

Milling Attachments Bridgeport Machines, Inc., Bridgeport, Comburke Machine Tool Co., Conneaut, Ohio Wm., Carroll & Son, Norwood, Cincinnati, Kearney & Trecker Corp., Milwankey, Wis.

Milling Cutters ister Tool Co., Master Tool Co., C Victor Mehy, Exch., Cleveland, Ohio

Milling Machine Live Centers otor Tool Mig. Co., Detroit, M Detroit, Mich.

Milling Machines, Bench,
Burke Machine Tool Co., Conneaut, Olio
Hardinge Brothers, Inc., Elmira, N. Y.
Sundstrand Machine Tool Co., Rockford,

Milling Machines, Hand Burke Machine Tool Co., Conneaut, Ohio Sundstrand Machine Tool Co., Rockford, Ill.

Milling Machines, Plain Burke Machine Tool Co., Conneaut, Ohio Kearney & Trecker Corp., Milwaukee, W Sundstrand Machine Tool Co., Rockford,

Milling Machines, Universal
Brown & Sharpe Mfg. Co., Providence,
Gorton Machine Co., Geo., Racine, Wis
Kearney & Trecker Corp., Milwankee,

Milling Machines, Vertical Blank & Buxton Mehy, Co., Jackson, Gorton Machine Co., Geo., Racine, W. Kearney & Treeker Corp., Milwaukee, Jackson, Mich.

Mills, Hollow Reisinger Mfg. Co., Rochester, N. Y.

Motors, Electric neoln Electric Co., Cleveland, Ohio ar Electric Motor Co., Bloomfield, N. J. Motors, Elec. Internal Brakes Star Electric Motor Co., Bloomfield, N. J.

Motor Drives, Universal

Berkeley Eugineering Co., Cleveland, Ohio Cullman Wheel Co., 1359 Altgeld St., Chicago Quality Hdwe, & Mch. Co., 5943 Ravenswood, Chicago Turner Uni-Drive Co., Kansas City, Mo.

Motor Units, Worm Gear ar Electric Motor Co., Bloomfield, N. J.

Moulds & Ladles, Hammer and Vise Johnson Tool Co., East Providence, R. I.

Multiple Ollers ts Bros. Mfg. Co., 1860 S. Kilbourn, Chicago Gits Nails

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Inc., John, Brooklyn, N. Y. Nibbling Machines Libert Machine Co., Green Bay, Wis, National Machine Tool Co., Raciuc,

Nut Setters

Cincinnati Electrical Tool Co., Cincinnati, Ohio Oil Cups Gits Bros. Mfg. Co., 1860 S. Kilbourn, Chicago

Oil Gauges Gits Bros. Mfg. Co., 1860 S. Kilbourn, Chicago

Oil and Grosse Seals Gits Bros. Mfg. Co., 1860 S. Kilbourn, Chicago Ollers, Automatic

Trico Fuse Mfg. Co., Milwaukee, Wis.

Pins, Leader and Dowel me Industrial Co., 210 N. Laffin St., Chicago jumbach Mfg. Co., E. A., 1812 S. Kilbourne Ave., Chicago, III. Raumbach

Pipe Threading Machines Triplex Machine Co., Pittsfield, Mass.

Pliers, Toggle Knu-Vise, Inc., Detroit, Mich.

Pliers, Welding Knu-Vise, Inc., Detroit, Mich.

Point Thinning Machines Oliver Instrument Co., Adrian, Mich.

Power Devices, Air-hydraulic Logansport Machine, Inc., Logansport, Ind. Press Brakes

Dreis & Krump Mfg. Co., 7440 Loomis Blvd., Chicago, Ill. Ward Machinery Co., 564 W. Washington, Chi-111

cago, III.

Press Feeds
Littell Machine Co., F. J., 4153 Ravenswood
Avc., Chicago III.
Rockford Iron Works, Reckford, III.
Wittek Mr., Co., 4309 W. 24th Place, Chicago

Presses, All Purpose mpco Products Inc., Bedford, Ohio

Presses, Arbor

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
Framco Macline Co., Racine, Wis.
Greenerd Arbor Press Co., Nashua, N. H.
Hanna Engineering Works, 1763 Elston, Chicago
Nicholson Co., W. H., Wilkesbarre, Pa.
Tomkins-Johnson Co., Jackson, Mich.
Wilson, K. R., Buffalo, N. Y.
Presses, Bench
Atlas Press Co., Kalamazoo, Mich.
Framco Machine Co., Racine, Wis.
Greenerd Arbor Press Co., Nashua, N. H.
Loshbough-Jordan Tool & Meh. Co., Elkhart, Ind.
Rockford Iron Works, Rockford, H.,
Presses, Broaching

Presses, Broaching central Arbor Press Co., Nashua, N. H.

Presses, Foot Famco Machine Co., Racine, Wi Rockford Iron Works, Rockford, Presses, Forming

- Latte we Mfg. Co., Marshalltown, Ia.

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Marshalltown Mfg. Presses, Hydraulic Atlas Press Co., Kalamazoo, Mich. Beatty Mch. & Mig. Co., Hammond, Ind. Greenerd Arbor Press Co., Nashua, N. H.

Fressee, Inclinable
Frederal Press Co., Elkhart, Ind.
Federal Press Co., Elkhart, Ind.
Lossbough-Jordan Tool & Meh. Co., Elkhart, Ind.
Marshalltown, Inc.
Marshalltown, Inc.
Marshalltown, Inc.
Marshalltown, Inc.
Ross Co., Davier J., Benton Harbo, Mich.
Ross Co., Power T. 1440, Loomis Blvd.,

Ross Co., Davis or Presses, Power Dreis & Krump Mg. Co., 7440 Loomis Blvd., Chicago, Ill. Federal Press Co., Elkhart, Ind. Loshbough-Jordan Tool & Meh. Co., Elkhart, Ind. Rockford Iron Works, Rockford, Ill. Ryerson & Son, Jos. T., 16th & Rockwell, Chgo. Presses, Punch

Presses, Punch wis & Krump Mfg. Co., 7440 Loomis Blvd.,

Preis & Krump Mrg. Co., Chicago, III. Co., 211 E. 47th St., New York, N. York, M. Tool & Meh. Co., Elkhart, Ind. York, N. Y.
Loshbough-Jordan Tool & Meh. Co., Elkhart, Ind.
Marshalltown Mfg. Co., Marshalltown, Ia.
Rockford fron Works, Rockford, Ill.
Ross Co., David J., Benton Harbor, Mich.
Presses, Sheat Metal.
Federal Press Co., Elkhart, Ind.
Loshbough-Jordan Tool & Meh. Co., Elkhart, Ind.

Loshbough-Jordan Tool & Mch. Co. Profiling Machine: Co. Gorton Machine Co., Geo., Racine Oliver Instrument Co., Adrian, Made Tool Co., Waltham, Mass. Pulleys, Steel and Wood Delta Mfg. Co., Milwaukee, Wis. Racine, Wi

Pumps

Brown & Sharpe Mfg. Co., Providence, R. I. Galland-Henning Mfg. Co., Milwaukee, Wis. Pumps, Centrifugal Logansport Machine, Inc., Logansport, Ind.

Pumps, Coolant Ruthman Machinery Co., Cincinnati Tomkins-Johnson Co., Jackson, Mich. Cincinnati, Ohio

Pumps, Lubricant
Ruthman Machinery Co., Cincinnati, Ohio
Punch, Shear and Bender, Hand
Armstrong-Rlum Mfg. Co., 5741 Bloomingdal
Are, Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.

Punch Press Guards Ross Co., David J., Benton Harbor, Mich.

Punches and Dies Lewthwaite Machine Co., 311 E. 47th St., New York, N. Y.

Punches, Hand
Armstrong-Blum Mfg. Co., 5741 Bloomingdale
Ave. Chicago, Ill.
Buffalo Forge Company, Buffalo, N. Y.
Lewthwaite Machine Co., 311 E. 47th St., New
York, N.
Sampson Tool Co., 101 Walker St., New York
Whitney Metal Tool Co., Rockford, Ill.

Punches, Hand and Power
Reatty Mch. & Mfg. Co., Hammond, Ind.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Punches, Piercing Durable Punch & Die Co., 711 W. Lake, Chicago

Punches, Transfer McMahon Co., Frank, Dayton, Ohio

Punches and Shears, Comb.
Rverson & Son, Jos. T., 16th & Rockwell, Chgo.

Pyrometers
Ill. Test. Laboratories, 150 W. Austin, Chica
Pyrometer Instrument Co., 102 Lafayette, N. Y. Pyrometers, Optical Pyrometer Instrument Co., 102 Lafayette, N. Y. C.

Pyrometers, Portable and Stationary Pyrometer Instrument Co., 102 Lafayette, N. Y. C.

Racks, Bar Stock Western Tool & Mfg. Co., Springfield, Wm. S. Yohe Supply Co., Canton, Ohio Ohio

Reamers Glenzer Company, J. C., Detroit, Master Tool Co., Cleveland, Ob Renu Tool Company, Detroit, Ohi Mich.

Rivets Hassall, Inc., John, Brooklyn, N. Y.

Rivets, Tubular and Split Chicago Rivet & Machine Co., 1855 S. 54th St., Cicero, P. O. Chicago, Ill.

Cicero, P. O. Chicago, III.
Riveters, Automatic Feed
Chicago Rivet & Machine Co., 1855 S. 54th St.,
Cicero, P. O. Chicago, III.
Tomkins-Johnson Co., Jackson, Mich.
Riveters, Multiple Spindle
Grant Mig. & Machine Co., Bridgeport, Conn.

Riveters, Pneumatic Grant Mfg.

Mfg. & Machine Co., Bridgeport, Cor Engineering Works, 1763 Elston Chicago, Ill. Riveting Machines

orge Company, Buffalo, N. Y. E. & Machine Co., Bridgeport, Con ngineering Works, 1763 Elston rant Mfg. Conn. nna Engineering Chicago, Ill.

Riveting Machines, Tubular and Split Chicago Rivet & Machine Co., 1855 8, 54th St., Cicero, P. O. Chicago, Ill. Rod Cutters

Armstrong-Hum Mfg. Co., 5741 Bloomingdale Are, Chicago, Ill. Lewthwarte Machine Co., 311 E. 47th St., New York, N. Y. Mfg. Co., 5741 Bloomingdale

Rotary Tables oake, Alfred A., Cincinnati, Ohio Troyke.

Mall Tool Co., 7742 S. Chicago Ave., Chicago, I Stanley Electric Tool Div., New Britain, Conn. Sterling Products Co., Detroit, Mich. Stow Mfg. Company, Binghamton, N. Y. Chicago, Ill.

Sanders, Disc aston Power Tools Co., Evergreen Park, Ill. Gaston

Saws Lock Diamond Saw & Machine Works, Inc., Natick, Mass.

Saws
Black Diamond Saw & Machine Works, In
Natick, Mass.
Saws, Electric Hand
Delta Mfg. Co., Milwaukec, Wis,
Mall Tool Co., 7742 S. Chicago Are., Chicago, I
Stanley Electric Tool Div., New Britain, Conn. Chicago, Ill.

Hawe, Metal Cutting Racine Tool & Mch. Co., Racine, Wis. Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Saws, Rotary Hack Stanley Electric Tool Div., New Britain, Conn.

Saw Sharpening Machines Wardwell Manufacturing Co., Cleveland, Ohio

Sawing Machines Continental Machine Specialties, Minneapolis Delta Mfg. Co., Milwaukee, Wis. Grob Brothers. Grafton, Wis. Wells Mfg. Corp., Three Rivers, Mich.

Scraping Machines, Hand & Pneumatic Anderson Bros. Mfg. Co., Rockford, Ill.

Screw Drivers, Electric Screw Drivers, Electric Cincinnati Electrical Tool Co., Cincinnati, Ohio Haskins Co., R. G., 623 S. California, Chicago Stanley Electric Tool Div., New Britain, Conn. Stow Mfg. Company, Binghanton, N. Y.

ew Drivers, Hand (Phillips)
Mch. & Tool Co., Dayton, Ohio

Screw Driver Bits (Phillips & slotted screws) Apex Meh. & Tool Co., Dayton, Ohio-

Screw Machine Parts Modern Collet & Machine Co., Econ Sutton Tool Company, Detroit, Mich. Ecorse, Mich.

Screw Machine P-oducts Economy Machine Products Co., 5207 Lawrence Ave., Chicago, Ill.

Screw Machines, Automatic Brown & Sharpe Mig. Co., Providence, R. I.

Screwplates Tap & Die Co., Greenfield, Mass.

Hassall, Inc., John, Brooklyn, N. Y. Strong, Carlisle & Hammond Co., Cleveland, O.

Set Screws, Headless and Hollow Economy Machine Products Co., 5207 Lawrence Chicago, Ill. III. ket Screw Corp., 4440 N. Knox Ave., Socket Chicago, Ill. Standard Pressed Steel Co., Jenkintown, Pa. Triplex Screw Co., Cleveland, Ohio

Shafts, Flexible
Haskins Co., R. G., 623 S. California, Chicago
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Pratt & Whitner, Hartford, Conn.
Krow Mfg. Company, Binghamton, N. Y.
Strand Co., N. A., 5001 N. Welcott St., Chicago

Shafts, Hangers & Boxes Delta Mfg. Co., Milwaukee, Wis.

Shapers Atlas Press Co., Kalamazoo, Mich.

Shears, Bevel Marshalltown Mfg. Co., Marshalltown, Ia.

Shears, Hand Arnistrong-Blum Mfg. Co., 5741 Bloomingdale Are, Chicago, Ill. Pererly Shear Co., 3007 W. 110th Pl., Chicago Levithwaite Machine Co., 311 E. 47th St., New York, N. Y. National Machine Tool Co., Racine, Wis. Whitney Metal Tool Co., Rockford, Ill.

Shears, Power
Reatty Meh. & Mfg. Co., Hammond, Ind.
Reatty Meh. & Mfg. Co., Hammond, Ind.
Ruffalo, N. Y.
Dreis & Krump Mfg. Co., 7440 Loomis, Chicago
Libert Machine Co., Green Ray, Wis.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.
Stanley Electric Tool Div., New Britain, Conn.

Shears, Sitting
Beverly Shear Co., 3607 W. 116th Pl., Chicago
Buffalo Forge Co., Buffalo, N. Y.
Dreis & Krump Mig. Co., 7440 Loomis Chicago
National Machine Tool Co., Racine, Wis.

Shears, Splitting Marshalltown Mfg. Co., Marshalltown, Ia.

Shears, Throatiess
Beverly Shear Co., 3007 W. 110th Pl., Chicago
Marshalltown Mig. Co., Marshalltown, Is.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Sheet Metal Machinery Libert Machine Co., Green Bay, Wis.

Glenzer Company, J. C., Detroit, Mich.

Sieeves, Intermeshing Durable Punch & Die Co., 711 W. Lake, Chicago

Socket Head Cap Screws
ontomy Machine Products Co., 5207 Lawrence
Are, Chicago, Ill.
fety Socket Screw Corp., 4440 N. Knox Ave.,
Chicago, Ill. Economy Chicago, III. Standard Pressed Steel Co., Jenkintown, Pa.

Spacing Collars es & Co., 1905 S. Rockwell St., Chi-Scully-Jon cago, Ill.

Special Tools and Machinery American Tool Works, Inc., Hartford, Conn. Reatty Meh. & Mfg. Co., Hammond, Ind. Quality Hdwe. & Meh. Co., 5943 Ravenswood, Chicago

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Cullman Wheel Co., 1359 Altgeld St., 4832 W. 16th St.

Speed Saws, Universal Wyzenbeek & Staff, Inc., 838 W. Hubbard, Chgo. Spools & Nuts for Auto. Screw Machines Sutton Tool Co., Detroit, Mich.

Split Rivets deago Rivet & Machine Co., 1855 S, 54th St., Cicero, P. O. Chicago, Ill.

Split Rivet Setters, Automatic Feed deago Rivet & Machine Co., 1855 S. 54th St., Cicero, P. O. Chicago, Ill.

Spot Welding Machines, Speed Interstate Machinery Co., Chicago, III, Pier Equipment Mfg. Co., Benton Harbor, Mich.

Sprockets Cullman Wheel Co., 1359 Altgeld St., Chicago Stainless Iron & Steel Carpenter Steel Co., Reading, Pa.

Stake Riveters Marshalltown Mfg. Co., Marshalltown, Ia.

Stampines Hamilton Tool Company, Hamilton, Ohio

Stamps, Steel
Colonial Breach Co., Detroit, Mich.
New Method Steel Stamp, Inc., Detroit, Mich.

Steam Specialties Strong, Carlisle & Hammond Co., Cleveland, O. Steel

Ryerson & Son, Jos. T., 16th & Rockwell, Chgo. Stools, Shop Standard Pressed Steel Co., Jenkintown, Pa.

Stop Watches Meylan, A. R. & J. E., 266 W. 40th, N. Y. C.

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Structural Shop Machinery Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Stud Setters Apex Machine Co., Dayton, Ohio

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Errington: Mechanical Laboratories, Staten Island, N. Y.
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Tube Flanging Machines Grant Mfg. & Mche. Co., Bridgeport, Conn.

Tubular Rivet Setters, Automatic Feed Chicago Rivet & Machine Co., 1855 S. 54th St., Cicero, P. O. Chicago, Ill.

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Universal Joints American Tool Works, Inc., Hartford, Conn.

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Barr McNy. Co., J. D., Indianapolis, Ind.
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Lake Machinery Co., 670 W. St., Louis, Mo.
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Drills, Radial 3f, 4f motor drive.
Drills, Allen, Avey, Sipp. 1, 2 and 4 spindles, h. s.
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Grinder, Walker 10f rotary suface.
Hammers, Pettingell trip, Nos. 1 and 2.
Lathe, Hardinge 9f x8f precision, q. c.
Lathe, 20f x8f Cisco q. c., taper attachment.
Lathe, 20f x8f Cisco q. c., taper attachment.
Lathes, turret, W. & S., B. & O., all sizes.
Millers, Brown & Sharpe Nos. 0, 09, plain.
Lathes, turret, W. & S., B. & O., all sizes.
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Miller, Nilwaukee No. 2B plain, s. p. d.
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Presses, hydraulic and pumps.
Rolls, levelling—7 rolls, 5f diam., 41 long.
Shapera, 16f 20f and 24f x10 gauge, 15f gap, Bolt threaders, Geometric, Acme.

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Grinder, No. 2 Brown & Sharpe surface, motor driven.
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Lathe, 14"x1', 10' Monarch, grd. head, motor in base.
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Fliling machine, No. 3 Thiel, m. d.
Grinders, Nos. 70 and 75 Heald internal.
Grinders, Nos. 3 & 33 abrasive surface, magnetic chk.
Grinders, Nos. 2 & 3 W. & M., surface, mag, chuck.
Grinders, Nos. 10 & 11 Brown & Sharpe Plain, m. d. Grinders, Nos. 10 & 11 Brown & Sharpe Plain, m. d. Grinder, No. 6 Gardner diac, m. d. Lathes, 12", 14", 16", 18", 24" Hendey, Millers, No. 2 Kempsmith late type plain, m. d. (2). Miller, No. 1 Brown & Sharpe plain, Miller, No. 3 Cinci, plain, high power, cone drive, Planer, 42"x42"x10" Liberty open side, m. d. Slotter, 6" Pratt & Whimey.

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Grinder, Cincinnati 16"x48" late type universal, all motor driven with latest type headstock, main drive is 74 h.p. 3 phase 69 cycle 229 volts, a.c. motor, power feed drive has 1 h.p., complete with standard equipment, machine guaranteed equal to new.

Grinder, Landis 12"x8" plain, suitable for rolls or shafts, will grind taper in inches per foot 24", automatic feed with spacing attachment, work rests, etc., condition group with about 16 960 lbb.

condition good, weight about 10,000 lbs.

Grinder, Seybold 72" automatic knife, T. & L. pulley
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type, has segmental grinding wheel with worm and
hand wheel for accurate setting for desired bevel,

hand wheel for accurate setting for desired level, condition guaranteed. Washing machine, Crescent model No. 10A for metal parts, made by Hobart Mig. Co., conveyor type, motor driven with full size tank, approx. 230 gallons, with side spray. Size of conveyor 18"x18", height inside 14", size overall 12"x4"6", condition excellent.

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Borer, car wheel, for 42" wheels.
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Bulldozer, No. 5 W. W., 24" stroke, crosshead 18x89\frac{1}{2}".
Grinder, No. 5 Brown & Sharpe surface, motor drive. Grinder, No. 3 Brown & Sharpe surface, motor drive. Grinders, Heim centerless, a. c., n. d. d. d. Grinder, No. 4 Gardner, dbl. disc. Miller, No. 4 Cincinnati, plain, cone. Miller, No. 6 Disc. Miller, No. 6 B. & S., plain, table 16"x54", cone. Planer, 36"x88"/12" Cincinnati, 2 heads. Press, No. 2 Toledo, o., b. i., 4" stroke. Press, No. 5 Toledo, "shaft, 64" stroke. Press, consolidated, s. n., 5" shaft, 64" stroke. Press, consolidated, s. n., 5" shaft, 64" stroke. Press, No. 97G Toledo, dbl. crank, 3" shaft, 72" wide, Press, No. 97G Toledo, dbl. crank, 8" shaft, 72" wide, Press, No. 97G Toledo, dbl. crank, 8" shaft, 72" wide, 2" stroke, 75,500 lbs. Shapers, 16", 20" and 24", various makes.

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Gearhobber, No. 3 Adams, 1 be Drills, 15 to 42 parties.

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Lathe, 14 "16" Hendey belted m. d. taper attach.

Lathe, 18 "18" Boye & Emmes . q. c.

Lathe, 36 "12" Lodge & Shipley.

Lathe, 28 "11" If L. & S. Q. c. g.

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Millers, Nos. 3 & 4 B. & S. plain.

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Punches, shears, bulldozers. Testing machine, 100,000 lb. Riehle, Large stock guaranteed electric motors. Any size.

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Buildozers, Nos. 2, 4, 6, 9, 28, 8, 20.
Crane, 10 ton Whiting, 43" Span. 220 d. c.
Crane, 10 ton Northern, 47.54" span. 220 v..d.c.
Drill, radial 5" Cincinnati-Bickford, motor drive 220 d.c.
Drill, radial 6" Reed-Prentice, single pulley drive.
Drills, 4 spindle Allen, No. 2 m. t., s. p. d.
Drill, multiple 25 spindle No. 30 Natco.
Drills, upright 10" to 36".
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Presses, o. b. i. No. 6 to 4.
Punch & shear, Beloit combination, No. 53 m. d.
Shapers, G. & E. 24", American 18", Cincinnati 16".
Shear, Chicago Steel, power, 10' -14 ga., m. d.
Shears, foot power, 30, 36, 42 and 52".

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SCREW MACHINES No. 00G B&S Auto, Slot, att.m.d. No. 1 & 11 B & S Hand m. d. No. 0 B & S Hand m. d.

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SHAPERS
24* Milwaukee back grd. crk.
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16* G. & E. b. g. crank.
16* G. & E. b. g. crank.
16* G. & E. D. g. crank, M. D.
24* Stockb. b. g. crank, M. D.
7 URRET LATHES
24* Bul'd. Vert Rap. Prod. M.D.
No. 2 Bardons-Oliver, Belt Dr.
No. 4 W. & S. apd. G. H. M. I. B.
No. 5 Foster All Grd. Hd. S. P. D.
No. 3A W. & S. Univ. 3-11/16*
Hole, M. D. Air Chuck.
No. 2A W. & S. univ. 3%* Hole,
a. p. d.

Hole, M. D., Air Chuck.
No. 2A W. & S. univ. 34% Hole,
p. d.
MISCELLANEOUS
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Broach, No. 2 LaPoint E. P. D.
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Brake, 6% 14 ga. D. & K.
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Die filer, No. 5 Rearwin, m.d.
Die filer, No. 5 Thiel, motor dr.
No. 2A Hi. Sp. Riv. Ham.
No. 2 Grant Riv. Ham.
No. 55 H. & W.
No. 2 Klemm Metal Band, M. D.
Saw, 6x6* Peer, univ. shpg. m.d.
Saw, 9x9* Peerlies, high speed.
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Square, Motor Drive.
Square, No. 1 Garvin, m. d.
Welder, 10'kwa Amer. Elec. Fus.
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52' KING VERTICAL BORING MILL

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3½ American Radial, Gear Box, Swinging

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24" Bullard with side head.
34" Colburn single turret.
34" Sides car wheel.

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51" Bullard. 60" Cichalt.

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21", 24" & 28" Cincinnati. 24" Barnes all geared. 21", 24", 28" Superior. 24" Aurora. 30" Snyder.

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spdl.
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Nos. 1 & 3 Bausch multiple,
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6 spdl.
Pratt & Whitney deep

6 spdl. Fratt & Whitney de hole.
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2 Morris radial.
3 American sensitive radial. borer

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radial

4' Mueller radial.
4' Hammond radial.
6' N.B.P. univ. radial.
Sensitive: All makes and sizes.

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Nos. 3B & B-1 Nazel hammers.
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No. 2 Cincinnati centerless. Nos. 72 & 72A3 Heald internal. No. 12 Bryant internal. No. 3 Barber Colman hob. No. 3 16"x32" 16"x32" Norton crank. 16"x48" Landis crank. 6"x48" Landis crank.
o. 4 Brown & Sharpe univ.
os. 1, 2 & 2 | Bath universal.
o 16 Blanchard surface.
"x18" No. 2 B. & S. surface. No. 4 No. 2 Norton 6"x36" "x36" Norton surface.
"x45" Bath surface. 7"x45" Bath surface, \$\sin \text{xx}\) 38" Manhattan surface, \$\sin \text{xx}\) 14" Pratt & Whitney BB surface, \$\sin \text{x}\) 14" At & Whitney BB surface, \$\sin \text{x}\) 16"x48" No. 5. Abrasive surf. \$\sin \text{x}\] 16"x48" No. 5. Abrasive surf. \$\sin \text{x}\] 20"x50" & Safety Emery surf. \$\sin \text{x}\] 15" And \$\sin \text{x}\] 24" & No. 8 & Gardner disc. Nos. 8 & 221 Badger disc. \$\sin \text{x}\] 24", No. 84 Gardner opp. disc. \$\sin \text{x}\] 24", No. 84 Gardner opp. disc. \$\sin \text{x}\] 24", No. 84 Gardner opp. disc. \$\sin \text{x}\] 10" 14"\sin \text{x}\] 27" 21" Norton: \$-4"x32" to \$14"x72". Norton: \$-2"x34" & 12"x44" univ. \$\sin \text{x}\] 21" x36" & 12"x48" univ.

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ENGINE LATHES
12", 14" & 16"x6' Monarch,
16"x6' Hendey grd, bd., TA.
16"x6' Lico geared head,
16"x9' Lelman geared head,
16"x9' Lelman geared head,
16"x8' Lodge & Ship, grd, bd.
16"x10" LeBlond, tap, & reliev,
18"x8x' Walcott,
20"x10' Reed Prentice grd, bd.
21"x18' LeBlond heavy duty.
24"x14' Amer., Geared Head,
24"x16' Schumacher Bay. 24"x14" Amer., Geared Head 24"x16' Schumacher Boye. 26"x12' Wickes, 44"x211' Wickes, 42"x24' Putnam geared head.

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2A, 3A & 6 W. & S. 3, 3 & 4 Foster. Nos. 2. Nos. 1B Nos. 1B, 3 18" Libby. 21" Gisholt 1½", 34" C 11", 31" Cincinnati Acme. 24" Bullard vertical.

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Nos. 3 & 4 Cincinnati. No. 2 Hvy. & 3B B & Nos. 2A & 2 Hvy. Mf No. 4 Hendey. Hvy. Mfg. Milw. No. 2 B. & S. 2 B. & S. universal.
3 & 4 Cincinnati vertical.
B1 & 6 Becker vertical.
3-24 & 4-36 Cincinnation. Nos. & 4-36 Cincinnati Hy-

B.&S. Mfg. Nos. 1 & 2 Kent Owens hand. Nos. 3 & 20 Sundstrand Rigidmil 66"x36"x8' Ingersoll adj. rail.

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24"x24"x2' Cincinnati crank. 24"x24"x6' Gray. 32"x32"x12' Niles. 32"x32"x12' Niles. 36"x36"x10' Cincinnati. 30 x30"x10" Chicinfall. 36 x36"x16" Cleveland openside. 42"x48"x12" Cleveland openside. 42"x30"x10" Liberty openside. 48 x36"x10" Liberty openside. 48 x48"x12" Woodward & Powell.

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98", No. 10C Bliss double crank, 60", No. 94E Toledo dbl. cr., between upair cush. ". No. 60D50 Cleveland dbl. 50". cr. 164 No. 1 No. 1 164 Toledo Toggle drawing.

1 Bliss toggle drawing.

266 Consolidated cam draw. No. 13 Bills toggle braving.
No. 266 Consolidated cam draw.
No. DDG Ferracute cam draw.
Ro. DDG Ferracute cam draw.
Ro. DDG Ferracute cam draw.
Ro. 354, 56, 563, 57 Toledo.
No. 354, Bilsa strandist side.
No. 394 Bilsa strandist side.
No. 394 Bilsa straight side.
No. 8-7 Zeh & Hahnemann.
No. CA 14 Ferracute horning.
No. 255 Consolidated horning.
Nos. 16 & 4A Bilsa borning.
Nos. P4 & FG4 Ferracute.
No. EG35 Erie punching.
No. 34 Consolidated punching.
No. 34 Consolidated punching.
No. 34 Toledo penhack.
40 ton Wat. Farrell openback.
No. 51 Cleveland OBI. No.

rrell openback. OBI. 75 Toledo openhacz ton Wat. Farrell of 51 Cleveland OBI. 5 Toledo, OBI. 7 Cleveland OBI. & 88 ton W.F. OB. Bliss die spotting. No. No. 106" OBI.

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20° Plain lever feed and wheel and lever feed.

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No. 24 V & O., O. B. I. (5)
No. 24 V & O., O. B. I. (5)
No. 25 V, & O., O. B. I. (2)
No. 5 V, & O., O. B. I. (2)
No. 5 V, & O., O. B. I. (2)
No. 19 Press, Niagara No. 116A.
No. 304 Bliss, O. B. I. (16A.
No. 304 Bliss, O. B. I. (18A.
No. 304 Bliss, S. S. Geardy

No. 306 Bliss S. S. Geared, No. 79‡ Bliss S. S. Geared, No. 37‡ Bliss S. S. Geared, No. 50 Toledo Arch Press.

No. 25 Niagara Arch Press

No. 30 Bliss Arch Press.

20" Plain lever feed and wheel and lever feed.
24" Barnes s. h., b. g., power feed.
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24" Bickford s. h., b. g.
Bausch multiple spindle, No. 1 m. t., power feed.

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4-spindle high speed.

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No. 1½ Valley City Plain Milling Machine.
No. 3 LeBlond plain milling machine.
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20*z0*x8* Ingersoll Miller, motor drive,
16* Ohio back geared crank shaper.

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No. 1 P. & W. 2 spdle. horiz., deep hole, m.d. & m., extra long bed (2). 6 spdle. P. & W. Deep Hole, vert., indiv. m.d. Fox, Natco & Bausch Mult. Spdle., m.d.&m. (8). No. 121, 217, 310 & 314 Baker (8). 21" & 24" Cincinnati Bickford (16). 3' Am. Sens. Hi Speed Radial, mtr. on arm. 31/2' Am. Radial, triple purp., encl. head. 31/2' Morris Radial, single pulley drive. Moline Hole Hog, various sizes (5).

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24" Bullard Rapid Production with side head. 18" Cinc. Semi-Auto., single & duplex heads. No. 3 Hall Planetary Thread, m.d. & m.

Planers 24"x24"x6' Gray Double Housing, b.m.d. 36"x30"x10' Am. Wid. Pat., 2 hds. on cr. rail. 24" Coulter Opens. Shaper Planer, m.d. with m. 36"x36"x14' Lib. Dble. Hsg., 3 hds., b. tb., m.d. 60"x80"x12' N. B. P. Planer, m.d. with

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10, 25 and 50 ton Henry & Wright with double roll feeds, belt & m.d.
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Betwick Rivet Heaters, 220 & 440 volts (4).
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National Bent Shank Tappers, ½" capacity.
3" con Shuster Wire Stratur, m.d. & m.
3" con Shuster Wire Stratur, m.d. & m. %" cap. Shuster Wire Stratur., m.d. & m. 20" Sellers Slotter, b.m.d, Reeves Trans.

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No. 2A B. & S. Univ., m.d., taper spdl. No. 3 Cinc. Univ., md., flanged spdl. No. 3 Kempsmith Universal, cone No. 4, 5, 6 Becker Vertical No. 22 Garvin Vertical No. ½, 2 Van Norman Duplex, m.d. No. 1, 2 Cleveland Plain, s.p.d. No. 2H Brown & Sharpe Plain, cone No. 2, 3, 4 Cincinnati Plain, cone No. 2B Milwaukee Plain, dbl. overarm No. 3 Kempsmith Plain, cone No. 4B Brown & Sharpe, Plain, s.p.d. No. 4 Cincinnati Plain, s.p.d. No. 4 Kemp. Pl. Maxi-Miller m.d. 6x48", 6x80" Pratt & Whitney Thd., belt 24" Cincinnati Automatic Duplex, m.d. 24" Cincinnati Plain Automatic, m.d. 24" Cincinnati Automatic Duplex, belt 48" Cinc. Worm Driven Pl. Autom., m.d. 48" Cinc. Worm Dr. Dup. Auto., m.d. 48" Oesterlein Tilted Offset, m.d. C66A Newton 3 spindle Contin., s.p.d. No. 30 Sundstrand Rigidmill, m.d.

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8 Bliss, ¼" cap. 8' Robinson, 10 ga. cap. 10' Ohl, 3/16" cap.

RADIAL DRILLS 6' Amer. Tr. Purp., m.d. on arm, 17" col.

4' Amer. Tr. Purp., gear box on base 21½', 4', 5' 6', 7' Am. Tr. Grd., gr. box 3' Amer. Sens., m.d. on arm, incl. hd. 3' Carlton Sensitive, m.d. 3', 3½', 4' Morris Plain, gear box 4', 5' Dreses Plain, gear box 4' Hammond Jack Knife, m.d. on arm 5' Cinc. Bick. Universal, d.c. drive 4' Cincinnati Bickford Plain, d.c. drive

PLANERS

6' Fosdick Plain, d.c. drive

7' Fosdick Plain, cone

24" Cincinnati Crank, m.d.
24"x24"x6' Gray, 1 head
24"x24"x6' Ohio, 1 head
28"x28"x10' Cincinnati, 1 head
30"x30"x10' American, 1 head
30"x30"x12' G. A. Gray, 2 heads, m.d.
32"x32"x8' Gray, 1 head
36"x36"x12' Fitchburg, 3 heads
36"x36"x12' Niles, 4 heads, m.d.
39"x39"x10' Cincinnati, 2 heads
48"x48"x14' Niles, revers. m.d., 3 hds.
48"x48"x15' Niles, revers. m.d., 4 hds.
48"x48"x15' Niles, revers. m.d., 4 hds.
48"x48"x16' Liberty, m.d., 4 heads
144"x76"x48' Liberty Open., revers. m.d.

BORING MILLS

30" Gisholt, belt 37" Niles, m.d., 2 heads 42" Bullard Rapid Production, 2 heads 42" Gisholt, gear box 42" King, m.d., 2 heads

PUNCHES AND SHEARS

60" Gisholt, m.d., 2 heads 62"Niles, m.d., 2 heads, new

Cleveland Single End, belt, cap. 1x1" Cleveland Single End, type EF, belt Cleveland EF Double End, m.d. Cleveland EF Double End, belt No. 3 Hilles & Jones, m.d. No. 6 Long & Allstatter, belt

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3-No. 12 G. & L. Terom. Int. Grinders. m.d.

1-No. 3 Hall Plan. Thr. Miller with air chk. 5-No. 12 Browne & Sharpe Pl. Grinders.

1-No. 11 B. & S. Motor Drive Grinder.

2-No. 1 P. & W. 2-sp. deep-hole Driller, motor drive.

1-Gould & E. No. 36 S T Gear Rougher. -Gleason 15" Hypoid Gear Lapper, m. d. 1-3% National Acme 4-spindle Automatic. 1-54" N. B. P. Vert. Boring Mill, 2 heads. 1-Natco No. C-13-H Hyd. Multiple Drill. I-No. 14 Natco Mult. Drill: 12-14 O. D.

spindle. 3-No. 310 Baker H. D. Drills.

I-No. 416 Baker H. D. Drill. I-84[®] Diamond Face Grind,, arr. for M. D. 2-% Model "G" Gridley Automatics.

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Cylindrical, 12x42*, 10x30*Landis.
Disc, No. 6-20 Besly.
Disc, No. 220 Badger & press.
Drill, New Yankee, D. E.
Universal No. 2 B. S.
Internal, Madison, Nos. 60 & 65
Heald. GRINDERS:

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HAMMERS: 50-lb, Little Giant BD, 50-lb, Little Giant MD, 40-lb, Bradley Helve. 120-lb. Kane & Roach.

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LATHES:
26°x12' Putnam Pacific type, DBG,
Semi-QCG, T. A. 26° Chuck.
16°x8'9', Hahn & Mayer.
16°x8'9' Alanh & Mayer.
16°x8'9' Alanh & Mayer.
16°x8'9' Alanh & Mayer.
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21° Type H, Gisholt, 6¾° hole.
24° Type I Gisholt, 4¾° hole.
24° Type I Gisholt, 4¾° hole.
No. 4 Bardon & Oliver 1½° cap.,
b. g. and p. f. to turnel.

No. 4 Bafdon & Criwer 172 Cap., b. g. and p. f. to turret. WILLERS: No. 1-B Keansey & Trecker Plain, No. 2 LeBlond, plain, M. D., No. 2 & 3 Kempamith, plain, No. 25 Becker-Brainard, No. 3B Owen, DH, Vert. att. No. 3½ Fox special.

PRESSES:

Hydraulic, 42-ton Elmes. OBI, No. 0, 4½ Loshbough-Jordan. Str. Side, No. 7 Z & H, geared.

PUNCHES & SHEARS: Queen City DE. ½ in ½*, M. D. Rock River L. ½ in ½*, 24 thr. Cleveland C. SE. ¾ in ¾*, 26 thr. No. L-10 Badger. DE. ½ in ½*,

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SHEARS: Jig, GEM, 18 ga. cap., M.D. Rotary Bevel, Lennox % . Square, Stark 9'; 18 ga. cap. THREADERS, Pipe & Bolt: Murchey, '4" dbl. head, bolt. Pipe, 2" Oster M. D.

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Saw, cold, No. 2-B Cochr.-Bly.

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Air compressor, 7x6 Worthington duplex m. d. Arc welder, 300 amp. Lincoln portable, m. d. Automatic, No. 00C.—B. &S.—m. d. d. Boring Mill, 24* Bullard, vert., rap. pro. Grinder, No. 20 Heald rot. sur., 9* ch., m. d. Grinder, 12* Arter, rotary surf., m. d. Grinder, surf. 12x 36 binm. auto., hyd. fd., m.d. Grinder, surf. 12x 36 binm. auto., hyd. fd., m.d. Grinder, well. 12x 36 binm. auto., hyd. fd., m.d. Grinder, No. 4 Gallmeyer & Livingston, surface, hyd. feed m. d., magnetic chuck.
Lathe, eng., 16x6 Amer., grd. hd., m. d. collets.

athe, 14x8 Hendey, collets, pan bed, ser. 25400 Lathe, 14x8 Hendey, collets, pan bed, ser. 25400 Lathe, 20x1 C isco grd, hd, m. d, tap. att. Lathe, eng., 30°x18' Hou-Stanw-Camble hyv.d. Mill & shap, Mach, No. 14 Coch-Bly, Milling machine, No. 2½ Rockford plain. Presses, Nos. 2, 3, 4 & 5 Bliss-Consol, o.b.i. pl. Presses, Nos. 5, 6, & 7 o. b. i., pl. presses, Nos. 5, 6, & 7 o. b. i., pl. presses, Press brake, 6' 6" Dreis & K. m. d. – pract. new. Shaper, Hendey 20° "V" ram, m. d. Shear, 10°, 14ga, 6', 14ga, 0, & K. pwr, md prac new Turret lathes, 2A & 3A W. & S. universal.

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3º bar Giddings & Lewis, horizontal, s. p. d. 4½° Bement Miles, horizontal, floor type 4½3 Bement Miles, horizontal, floor type No. 8 Niles, horizontal, floor type, duplex. 4° bar Pawling & Harnischfeger, floor type, 84° Niles, vertical 2 swivel head, floor type, 84° Niles, vertical, extension type. ATHES: 152° Pit Lathe, triple geared, belt drive, 60° x27° Engine Lathe, triple geared, 42° x30° Bement, cone drive, 36° x 18° Harrington, cone drive,

36's 18' Harrington, cone drive.
30's 18' Gleason, cone drive.
24's 12' Lodge & Davis, belt drive.
24's 12' Lodge & Shipley, q. c., taper attachment.
24's 12' National, q. c. taper attachment.
20's 16' Hamilton, cone drive.
20's 16' Lodge & Davis, cone drive.

20"x9' Lehge & Davis, cone drive, 20"x9' Lehman, q. c. cone drive, 18"x6' Lehman, q. c., cone drive, 30" Gisholt Turret Lathe, cone drive, 21" Gisholt Turret Lathe, cone drive.

PLANERS:

LANERS: 72"x58"x18" Belmer, 4 heads, 12'x9"x20" Bement, 4 heads, 56"x52"x15" Gray, 4 heads, 24"x24"x6" Gray, 1 head, DRILLS:

4' Mueller Radial, s. p., gear box. 4' and 6' Niles Radials, b. d. 3' Plain Radial, belt drive.

3' Plain Radial, belt drive.

WELDERS:
65 KW Federal Butt Welder,
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No. 19 Keyseater, belt drive.
150 ton Horizontal Hydraulic Forcing Press
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36" Bullard "New Era" 24", 36" Bullard "New 30", 52" King. 42" Gisholt. 48", 54", 60" Colburn. 62", 72" King.

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1, 2, 3, 4-spdl. Leland-Gifford.
1, 2, 3, 4, 6, 8-spdl. Henry & Wright.
No. 2 Colburn, 1, 3, 4 Spindle.
No. 4 Colburn, 2 Spdl.
No. 2, No. 3 Defiance Hvy. Service.
No. 314, 416 Baker Heavy Duty.
No. D4 Colburn Heavy Duty.

No. D-4 Colburn neavy busy.
No. 14 Natco Multiple.
No. 1, No. 3, No. 4 Baush Multiple.
4' Western Plain Radial.
5' Cinn-Bickford Plain Radial.
5' American Full Universal Radial.

Western Plain Radial.

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No. 12, No. 1 Pfauter Hobber. No. 4-36", No. 4-48" Brown & Sharpe. No. 4—36", No. 4—48" Brow No. 2, No. 3 Pfauter Hobber. No. 6—60" Brown & Sharpe. No. 2—60" Goss Hobber. Nos. 6, 61, 615, 62, 624, 645 Fellows, M.D.

8"x18", 36" Cinn. Plain, Saddle Type. 20"x168" Landis Pl., Motor Drive. 26"x96" Landis. No. 2 Brown & Sharpe Universal. No. 4, No. 4-A Landis Universal. Nc. 70 Headd Internal.

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6"x32" 10"x50" 10"x18" 10"x72" 10"x24" 10".15"gapx72" 10"-15"gapx24" 14"x36" 14"x50" 14"x72" 14"x96" 16"x50" 16"x72" 20"x96" 14"x50" 18"x96" 22"x120"

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Gisholt Universal Tool Grinder.

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Rotary Table. Milling Attach., etc.
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No. 33 Kempamith Production; M.D.
No. 2 Cincinnati Universal, Cone.
6*z48* P. & W. Thread, Belt Drive.

LATHES 30⁸x17¹ Houston, Stanw.'& G.; B.D. 26⁸/48⁸x28¹ McCabe Dbl.Spdl.B.D. 16"x8" American Motor-in-Base. 16"x8" L. & S.; Sel. Grd. Hd. M. D. 14"x6" American Geared Head; M.D.

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7-Ft. Amer. Trip. Pup., Mrr. on Arm.
7-Ft. Amer. Trip. Pup.; Pl., Mtr. on A.
4-Ft. American Piul (1), Mtr. on A.
4-Ft. American Plain; M. D.
3½/ American Plain; S. P. D.
3½/ Ft. Cinn. Bickford Plain; S. P. D.
24 Cinc.-Bick, Slid. Hd. DrillS. P. D.

No. 2B Edlund 4-apdl. B. B.; M. D. No. 2 Avey 4-apindle B. B.; M. D.

No. 2 Avey 4-spindle B. B.; M. D. AUTOMATIC SCREW MCHS. No. 2G Brown & Sharpe; M. D. 5-Spindle Acme 9/16* Medel "C" with Slotting Attach.; M. D. 2%* Gridley Model "G" 4-spindle; 1¼* Cone 4-spindle; Motor Drive. No. 2 Brown & S. Wire Feed; B. D.

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48"x48"x16' N-B-P; 2 rail and side

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BENDING ROLLS, Wickes 12'x
1½" Vertical; largest roll 23" dia.;
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PLATE PLANER, 18' Hilles & Jones, capacity 348

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Press. Wells, gang, No. 12. 6' bet, housings. No. 17 Bliss, gap frame, \$7" bed, 8" st. Press, Wells, gang, No. 12, 6' bet. housings. Hyd. Watson S., 200 ten, 2-10" rams.

PRESSES, Toggle

PRESSES, Togqle
No. 408-B Bliss, 84" bet. up.; 58x84.
No. 5; No. 334; No. 312A; No. 314B Bliss
PRESSES, O.B.I.
No. 6A Bliss, 7" st., No. 5 Toledo; No. 3
Nia.; No. 62 Bliss, 8" st.
No. 77 Toledo, b.q., gap frame.
No. 4 L. 6 I.; No. 4 McDonald.
PRESSES, Horn
Nos. 1434: No. 44P Toledo, swing sable.

Nos. 1434; No. 44P Toledo, swing table, 1442, No. 41; Bliss No. 21; No. 24. PRESSES, Coining Toledo No. 666—1000 ton; No. 664—600 t. No. 2000 ton; No. 664—600 t.

No. 27K Bliss 1000 ton. 600 ton Waterbury-Farrel.

PRESS BRAKES

Chicago All Steel, gap frame, 5' 10 ga.; 78" 14 ga.; 52" 18 ga; 10' 10 ga.
PRESSES, Style P4; Toledo, 34P

Ferracute No. P2. P3. P4: Tole (10): No. 3, 4, 4N-5N Bliss. OTHER TOOLS IN STOCK Angle Iron Shears, Coving., 6x4x%", dbl. end. Automatics, Brown & Sharpe, late serial.
No. 00G—serial No. 9900; No. 00 serial

No. 9800; No. 0G over 6700.

Boring mill, 38" Bullard New Era, side head.

Boring Mill, 24" Bullard with side head. Boring Mill, 24" Buildrd with side head.
Boring mill, 88" Niles vertical—42" N.B.P.
Brakes, hand, 10" 14—8" 16, 8" 12, 8" 18.
Brakes, pwr., Chicago Steel; 8" ¼"; 12" 10 ga.;
10" ¾"; 10" ¼"; 12" ¼", pwr. clamp.
Compressor, air, 10x10, 9x8.

Drill No. 242 Barnes Camel Back.
Flanger, ½" McCabe.
Furnace, large elec., heat treat., pusher type.
Gang Slitter, 48" Bliss, 38" Cameron.
Grinders, Surf.—No. 2 Dia., No. 3 Abrasive
Surf. 84" Diamond Face.
Grinder, 16x66 Landis, No. 12 B. 6 S.
Grinder, 16x66 Landis, No. 12 B. 6 S.
Grinder, No. 11 B. 6 S. Self-contained.
Groovers, pow., 8" Nia.; 6" Stoll; 3" Nia.
Hammer, drop, 400 lb. Standard.
Honworker, No. 3 Ry. 4x6x14; Oaking 6"x8".
Lathes, South Bend., 9"x314; 16/24 gap x8".
Lathes, 30"x16" L6x5., 48"x18 Schu. 6 Boye.
Lathe, 36"x30" L. 6 S., 24' centers, q.c.g.
Lathes, 10x16; No. 28. K. 6 S., g.h., m.d.
Lathes, psin, Pryibil 22" bb; 20" Bliss.
Millers, Pl., No. 2A K. 6 T.; No. 1A K. 6 T.
Millers, vert. No. 2, 3, 48, \$5 Becker, No. 3 C.
Millers, vert. No. 2, 3, 48, \$5 Becker, No. 3 C.

millers, 9-3 cinc. ft.; No. 21 S. & S., No. 2 Cin. Millers, vert. No. 2, 3, 48, 58 Becker, No. 3 C. Miller, 48" Cinc. cuto.; No. 3 Garvin Dup. Miller, Ingersoll, 48"x22".
Nibblers, Campbell, No. 1 & 18, m.d.; No. 2.
Pipe Threaders, 2" to 10".
Pipes 12"x8" ("June 14").

Planer, 26"x8" Cleveland, openside.
Press, Hyd. Whl., S00 ton, 48" Bet. bars.
Saw, Friction, No. 1, No. 0 Ryerson & No. 2.
Roller, levellers, 48" 17 rolls, motor drive;
36" H. & J., 18 rolls.

36" H. 6 J., 18 rolls.
Rolls, Bend, 10' 18 ga. Beloit; 10' %" H. & J.,
4' 10 ga., 3' ½".
Rolls, bending, 8' %" Niles, drop end.
Screw mach., auto., 4 spdle. Gridley, 134"
Shapers, 16" & 24" G. & E.
Shear, Pels angle & beam, 8x8x¾".
Shears, throatless, 10 ga. ½", ½".
Shears, 52" 10 ga.; 52" %" Chgo. Steel.
Shears, 52" 10 ga.; 52" %" Chgo. Steel.
Shears, 70 ga.; 10' 10 ga.; 10' 16 ga.; 10'
14 ga. Bestsch.

14 ga. Bertsch.

14 qa. Bertsch.
Shears, pow., 6"x½" Thomas 24" qap; 6"x%"
Chgo. Steel 24" qap; 6"x10 qa. Stoll; 6"
. 10 qa. Rob., 10" 18 qa. & 10"14 qa. Nia.
Shears, Rot. Quickwk.; No. 10, 60" Thr., 14 qa.
Shears, 10" 3/16 Toledo.
No. 25 Quickw., 7'32" cap., No. 3.
Welders spot: 5, 7½, 10, 25, 50KW; press type
100 KW Federal; 75 KVA National.
Wire straightener, %"x8"; No. 6 Wells, %x22".

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9	2.65	40	1.37
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II	2.56	42	1.35
12	2.56	43	1.26
13	2.36	44	1.26
14	2.36	45	1.26
15	2.36	46	1.22
16	2.26	47	1.22
17	2.26	48	1.22
18	2.19	49	1.22
19	2.12	50	1.17
20	2.12	51	1.17
21	2.12	52	1.17
22	2.03	53	1.17
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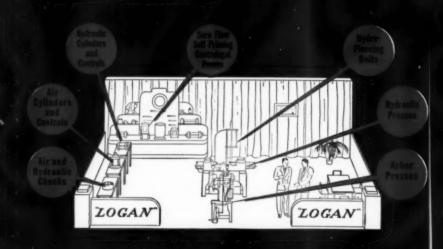
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